WORLD PETROLEUM

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OCTOBER 1954

Experience **IS THE HOLE CARD**...the experience gained in 22 years of perforating service in every major oil field in this country...plus thorough knowledge of your own local conditions and problems.

There's the combination that has hung a success record of better than 97% in well over 200,000 perforating jobs for satisfied operators.

LANE-WELLS COMPANY

TECHNICAL OIL FIELD SERVICES

Tomorrow's Tools—Today!®

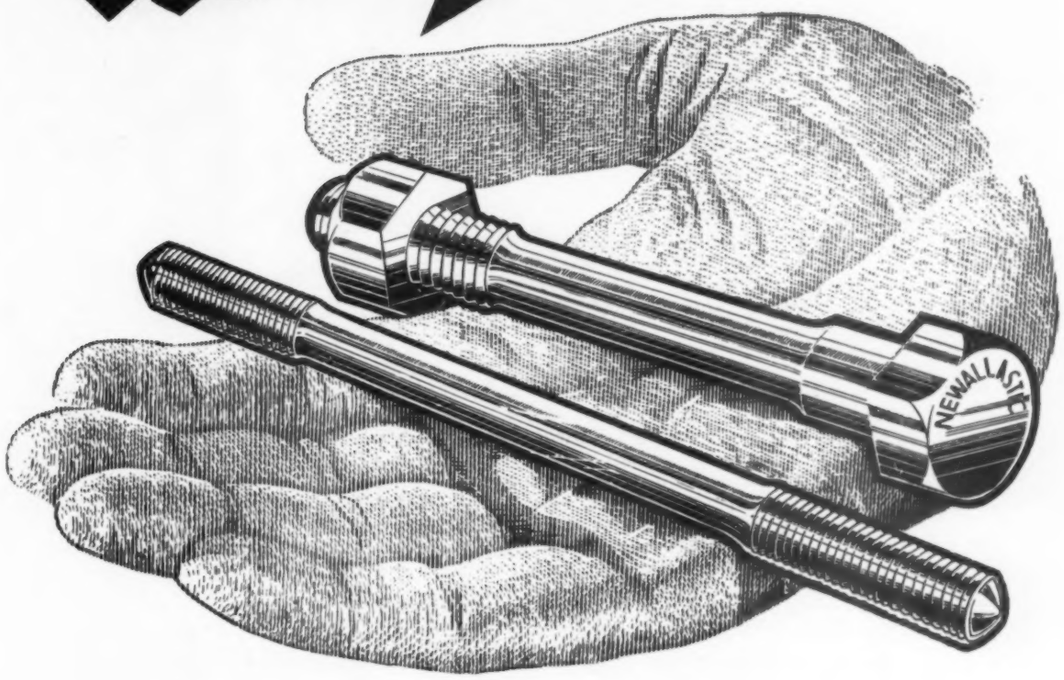
Ask for more information about LANE-WELLS BULLET PERFORATING

General Offices, Export Office and Plant • 5610 So. Soto St. • Los Angeles 58, California

Los Angeles • Houston • Oklahoma City • Lane-Wells Canadian Co. in Canada • Petro-Tech Service Co. in Venezuela

AG-705

Unique



"Newallastic" bolts and studs have qualities which are absolutely unique. They have been tested by every known device, and have been proved to be stronger and more resistant to fatigue than bolts or studs made by the usual method.

C. P. Newall & Co., Ltd.

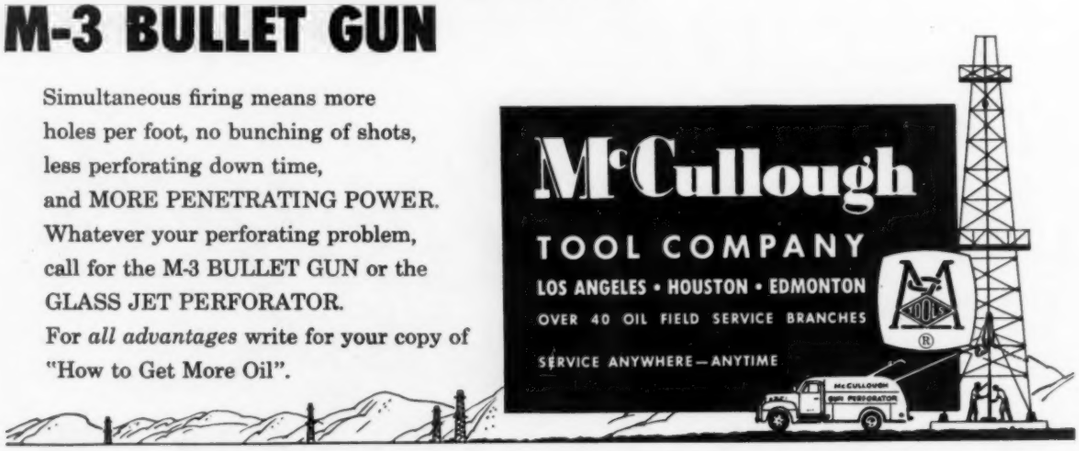
POSSILPARK GLASGOW · N

Look at the Hole Pattern . . .

holes are exactly the same pattern as the chambers in the gun

. . . must be a McCULLOUGH M-3 BULLET GUN

Simultaneous firing means more holes per foot, no bunching of shots, less perforating down time, and MORE PENETRATING POWER. Whatever your perforating problem, call for the M-3 BULLET GUN or the GLASS JET PERFORATOR. For *all advantages* write for your copy of "How to Get More Oil".



FOR BEST RESULTS LOG AND PERFORATE BY McCULLOUGH

WORLD PETROLEUM for October, 1954. Vol. 25, No. 11, October, 1954. WORLD PETROLEUM is published monthly by Mona Palmer, Trustee under the will of Russell Palmer, 604 Fifth Ave., New York 20, N.Y. Authorized as Second Class Matter, P.O. Dept., Ottawa, Canada. Subscription rates: $5.00 per year, single copies $1.00. Copyright 1954, by Mona Palmer, Trustee.

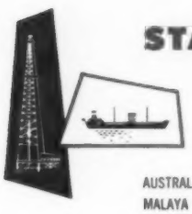
KNOWLEDGE
a power for good

The Standard-Vacuum organization is continually expanding its educational and training programs for its 40,000 employees in the various areas where it operates.

In Indonesia, for example, 71 formal training courses as well as on-the-job instruction are giving several thousand men new skills . . . teaching them to work as a team and to produce more . . . improving their ability to shoulder responsibility . . . adding to their economic security as individuals and their economic strength as citizens.

Stanvac seeks to do its part in developing the capacities of its employees so that they become better qualified to carry on the company's operations and to participate in supervisory and administrative functions.

Greater knowledge is truly a power for good.



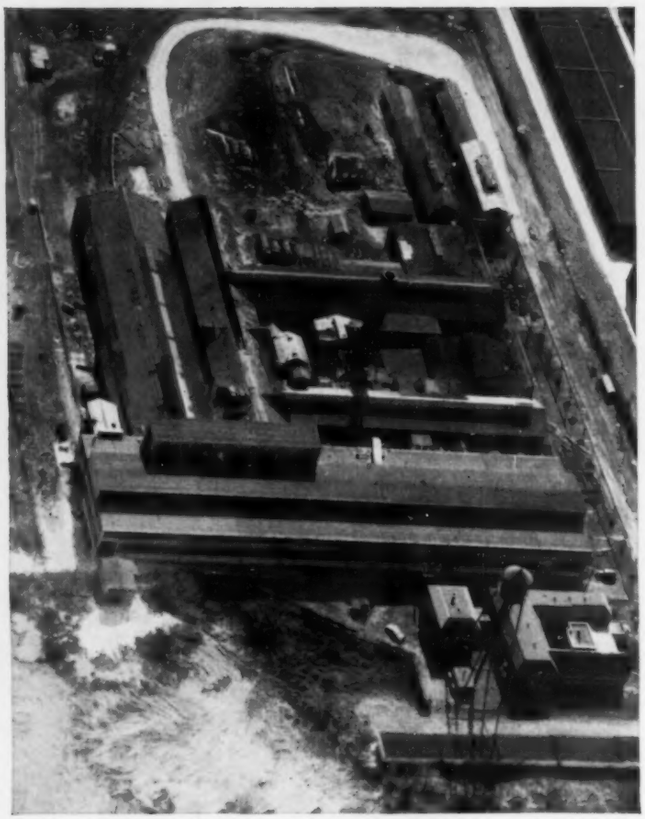
STANDARD-VACUUM OIL COMPANY

A name that stands for "Progress" in the East

26 BROADWAY, NEW YORK 4, N.Y.

AUSTRALIA • BURMA • CEYLON • HONG KONG • INDIA • INDO-CHINA • INDONESIA • JAPAN • KENYA • MADAGASCAR
MALAYA • NEW ZEALAND • PAKISTAN • PHILIPPINES • PORTUGUESE EAST AFRICA • RHODESIA • SINGAPORE
SOUTH PACIFIC ISLANDS • SOUTH WEST AFRICA • TANGANYIKA • THAILAND • UNION OF SOUTH AFRICA

New GRAVER Edge Moor Plant



...occupying 25 acres

at Edge Moor, Delaware

(adjacent to Wilmington)

for the manufacture

of towers pressure vessels

...eastern headquarters for field-erected tankage

and exclusive GRAVER conservation designs

GRAVER TANK & MFG. CO., INC.

East Chicago, Indiana

CHICAGO • NEW YORK • PHILADELPHIA • EDGE MOOR, DEL. • ATLANTA
CATASAUQUA, PA. • PITTSBURGH • CLEVELAND • DETROIT • TULSA
SAND SPRINGS, OKLA. • HOUSTON • ODESSA, TEXAS • CASPER, WYO.
LOS ANGELES • FONTANA, CALIF. • SAN FRANCISCO

GRAVER ...tank fabricators for 97 years

OIL
MUST BE DISCOVERED

SSL shooting in the Middle East.

In the MIDDLE EAST an interest in the surface manifestations of oil and natural gas arose with the first civilisations. Sumerians used asphalt in building; eternal fires, fed by natural gas seepages, were worshipped in early history. Today, as oil products become more and more indispensable, great oil fields hidden below the surface have been discovered in the Middle East by modern scientific methods.

Much of the area is desert, varying from hard rocky surfaces to sand in all its forms, sandy plains or great dunes; but in the "fertile Crescent" there are irrigated areas. Along the shores of the Persian Gulf lie wide stretches of salt marsh.

Seismograph Service Limited has long worked in this area. In carrying out these assignments, sometimes quite difficult, Seismograph Service Limited draws freely on the world-wide experience accumulated by itself and its associate companies — Seismograph Service Corporation of U.S.A., Seismograph Service Corporation of Venezuela, of Mexico, of Canada, of Colombia, and Compagnie Francais de Prospection Sismique of France. Though the operational activities of these companies are confined to different areas of the world, there is no limitation amongst them in the pooling of research, techniques and experience.

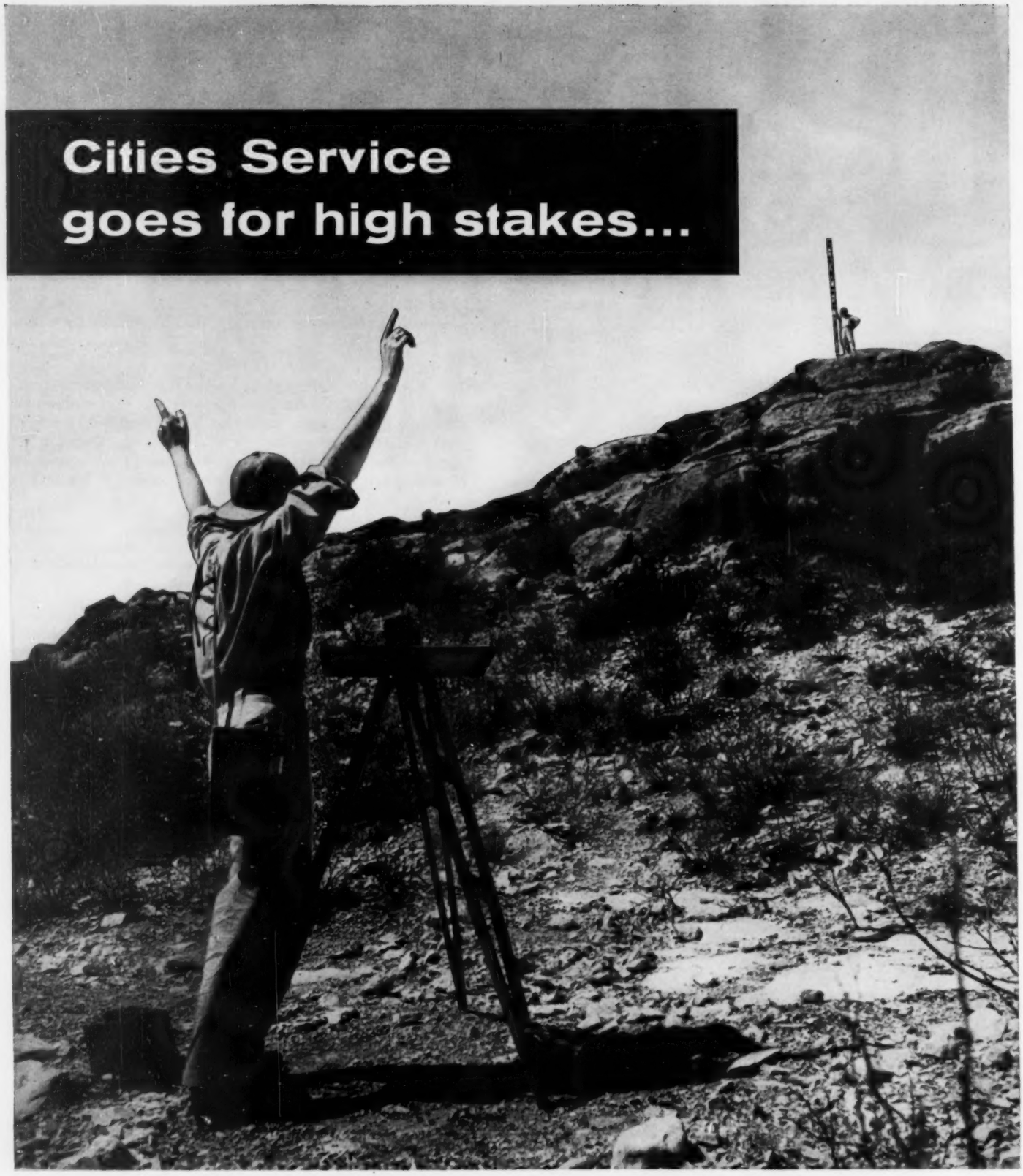
Seismograph Service Limited

CABLE ADDRESS:
"SEISLIM, LONDON"

INLAND TELEGRAPHIC ADDRESS:
"SEISLIM, BROMLEY"

"HOLWOOD," KESTON, KENT, ENGLAND

SUBSIDIARY OF SEISMOGRAPH SERVICE CORPORATION, TULSA, OKLAHOMA, U. S. A.



Test wells are put down on an average of one every 4 days by

CITIES SERVICE

A Growth Company

Sampling "pins" on Ethyl's "whirling pin cushion" move past a specially constructed opening in the cylinder head of a test engine and pick up combution deposits—as they are being formed.

ETHYL RESEARCH BUILDS A "WHIRLING PIN CUSHION"

to probe the secrets of combustion deposits

Ethyl laboratories "fingerprint" the deposit on each sampling "pin" by X-ray diffraction.

A special whirling disk developed by Ethyl research people may help technologists come up with the answer to one of the "hottest" problems facing the petroleum and automotive industries.

The problem: Exactly what can be done about the deposits that build up in the combustion chamber of a modern gasoline engine?

Only when researchers can understand what they are and how they form through the interaction of fuels, oils, additives and the metals of the engine will it be possible to render these deposits harmless.

Ethyl research people have been at work on the problem for years and in many different ways. Recently, they made another step forward when they developed an amazingly simple test instrument they affectionately call the "whirling pin cushion."

By spinning the pin cushion in a special test rig, researchers are now able, for the first time, to trace the step-by-step formation of combustion products—at all phases of the cycle.

This is another milestone in basic research on combustion-chamber deposits.

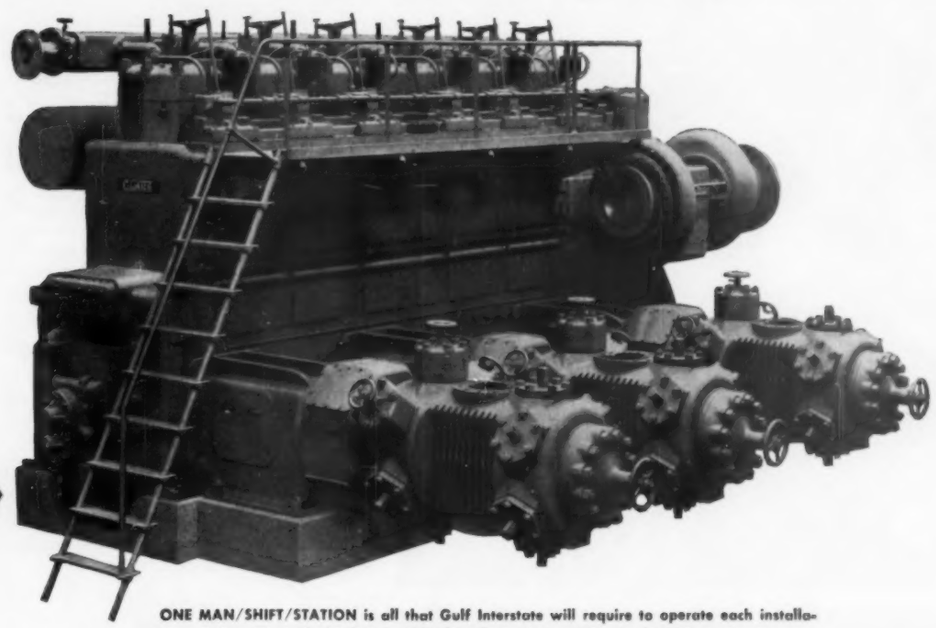
New test instruments at Ethyl Laboratories like the "whirling pin cushion" are helping us piece together the fundamental knowledge which will eventually open the door to engines and fuels of far greater efficiency than are possible today.

ETHYL CORPORATION
Research Laboratories
1600 West Eight Mile Road, Ferndale 20, Michigan
2600 Cajon Road, San Bernardino, California

Here's the pattern for gas transmission pipeline compressor stations of the future!

NEW GULF INTERSTATE SYSTEM

Selects the Clark Turbocharged Model TLA-6 for its Automatic, Push-Button Operated Stations



ONE MAN/SHIFT/STATION is all that Gulf Interstate will require to operate each installation of four Clark Model TLA-6, 2000 bhp Turbocharged Gas-Engine-Driven Compressors. Air-cooled, high efficiency, pipeline compressor cylinders assure maximum gas thru-put.

It's already an accepted fact that the Gulf Interstate Gas Company has changed the pattern for natural gas transmission with its one man, push-button controlled, automatic compressor stations.

With such advanced thinking, it's only natural that Gulf Interstate will be the first to use the NEW Clark Model TLA, 2000 bhp, Turbocharged Compressors in conjunction with their newly developed system of controls.

Gulf Interstate's control devices for automatic operation of these Clark Compressors did not appreciably increase the installed cost.

If you're interested in a compressor station that can be operated with the highest possible efficiency — *automatically* — while still maintaining station-loading flexibility, be sure you investigate Clark Models TRA and TLA Compressors. There are 8 sizes in a range of 825-3300 bhp. Ask your nearest Clark representative for Bulletins 130 and 134.

CLARK BROS. CO. • OLEAN, N. Y.
ONE OF THE DRESSER INDUSTRIES
Sales Offices in Principal Cities Throughout the World

A dozen ways you'll be ahead with Clark TLA's

- 7000 btu/bhp/h fuel consumption.
- 40% less cooling required.
- 25-30% lower installation cost.
- Drastic reduction in number of moving parts.
- 90% engine mechanical efficiency.
- Detonation-free operation under all climatic conditions.
- Generous temporary overload capacity.
- Specifically designed for turbocharging.
- Low cycle temperatures for maximum cylinder and ring life.
- Only one turbocharger per unit.
- Unapproached for accessibility.
- 2-cycle simplicity, dependability.

CLARK compressors

Clark sets the pace in compressor progress

Motorists: here's proof...

Gulf's cleaner-burning, super-refined gasoline solves today's No. 1 engine problem!

This lamp is burning the "DIRTY-BURNING TAIL-END" of gasoline which GULF refines out
This lamp is burning NEW SUPER-REFINED GULF NO-NOX, the cleaner-burning super-fuel

Laboratory tests promised...

. . . these *immediate* and *lasting* benefits from this new, super-refined fuel:

More complete engine protection than from the so-called "miracle-additive" gasolines. Why? Because Gulf refines *out* the "dirty-burning tail-end" of gasoline (the No. 1 troublemaker in high-compression engines)—and then treats this new Super-Refined NO-NOX to give it a *complete range of protective properties*. It protects *every* part it touches against carbon, rust, gum.

Extra gas mileage in all your everyday, short-trip, stop-and-go driving.

No knock, no pre-ignition. Why? Because the anti-knock power of new Gulf NO-NOX has been stepped up to an all-time high.

Stall-proof smoothness. Instant *starts*, too—and fast, fuel-saving warm-up.

That's why new Super-Refined Gulf NO-NOX gives your engine more power-with-protection than you've ever known.

Road tests proved...

These cars, powered by New Gulf No-Nox, actually performed better than new . . . after 15,000 miles!

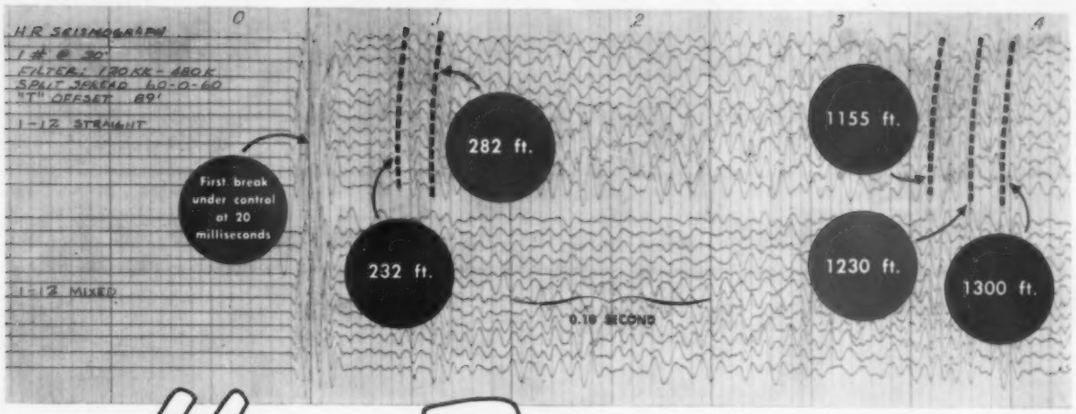
True! After 15,000 miles per car—covering all conditions of city and country driving—Gulf test cars showed these results:

- Higher-than-new horsepower!
- Better-than-new on gasoline mileage!
- And not a single trace of carbon knock or pre-ignition at any time—even on the steepest mountain grades!

COMPLETELY NEW! SUPER-REFINED

New Gulf No-Nox

THE HIGH-EFFICIENCY GASOLINE



High Resolution

here's a new record for near-surface seismic data

If you're plagued with the problem of obtaining accurate near-surface seismic data, look carefully at the record illustrated here. With first breaks under control in 20 milliseconds, a reliable reflection was obtained at a depth of 232 feet. This record is typical of the results obtained by the new Houston Technical Laboratories High Resolution Seismic System. A major development in geophysical prospecting, the HTL portable HR System now makes possible reliable reflection surveys over a depth range of 100-2500 feet. It is especially designed for use in petroleum exploration, mining, ground water location, and civil engineering where shallow seismic information is vital.

WRITE for Technical Bulletin No. S-303 for additional information about how you can now make reliable *shallow reflection* surveys.

use the HTL portable HR seismic system to:

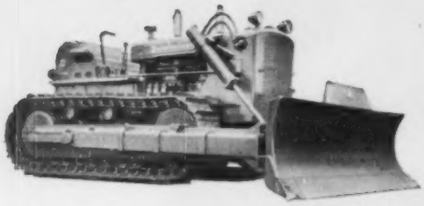
- establish near-surface velocity control
- obtain near-surface structural data
- supplement core-hole information

HTL

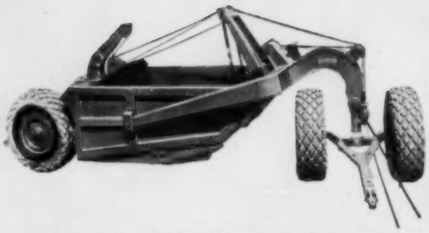
HOUSTON TECHNICAL LABORATORIES

A SUBSIDIARY OF TEXAS INSTRUMENTS INCORPORATED

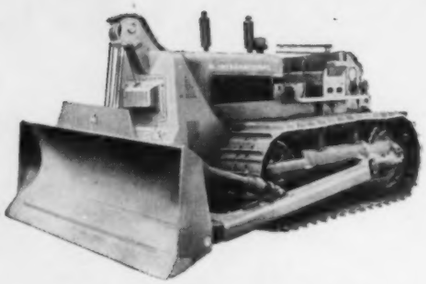
2424 BRANARD • HOUSTON 6, TEXAS, U.S.A. • CABLE: HOULAB



International TD-24 crawler tractor with hydraulic bullgrader



International B-250 four-wheel scraper for use with the TD-24 tractor



International TD-24 crawler tractor with cable tilt-dozer

International 2T-75 two-wheel rubber-tired tractor and 18 yard scraper

International TD-14A crawler tractor with hydraulic skid-shovel

International 2T-75 two-wheel rubber-tired tractor and bottom dump wagon

Hough Payloader — 4-wheel tractor with front-end loader

1 source of supply for ALL your EARTHMOVING equipment

Now – grouped under the world-famous IH symbol – International offers a complete line of heavy-duty machines for every phase of earthmoving. This means that now, more than ever, your International Industrial Power distributor is your "Earthmoving Headquarters"– a single source of supply for machines, service and parts.

You'll find the right equipment to power your job faster, better and more profitably – backed up by unsurpassed service facilities and parts supplies to keep your equipment operating. You cut down-time, pile up profit-time *every time* with International.

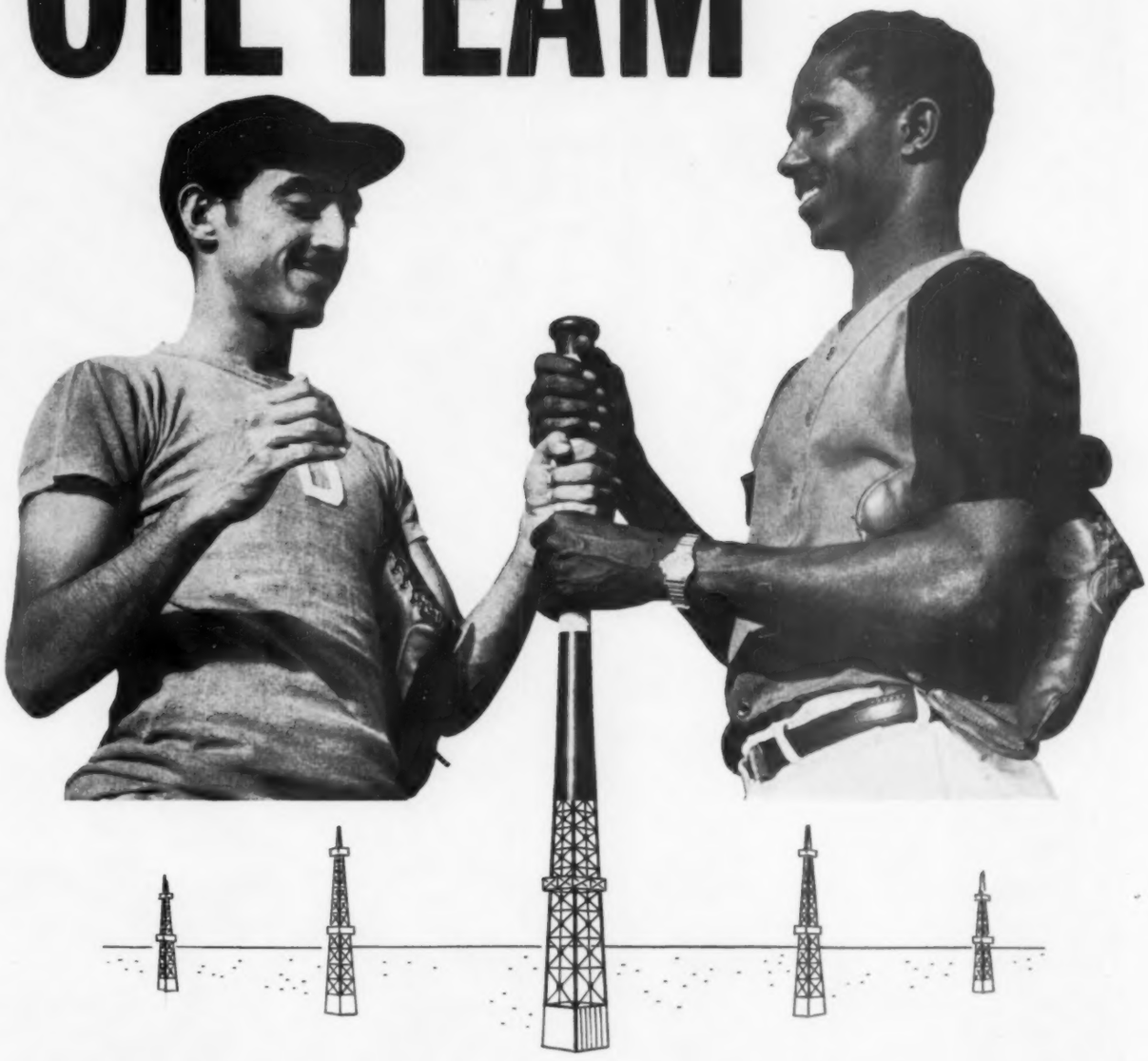
A demonstration will prove that it's International "Power That Pays"–see your IH distributor today. International Harvester Export Company, 180 North Michigan Ave., Chicago 1, Illinois, U.S.A.

- Seven powerful crawler tractors headed by the giant TD-24
- Twenty-two matching hydraulic and cable controlled bull-dozers, bullgraders and tilt-dozers
- Four 4-wheel scrapers matched for use with the TD-24 and TD-18A tractors
- Two high-speed, 2-wheel rubber-tired tractors with 18 and 13 yard scrapers
- High-speed bottom dump wagon with 20 yard capacity matched to the 2T-75 tractor
- Eighteen 6 and 4 cylinder diesel and carbureted power units
- A complete line of auxiliary equipment including cable control units, generators, pumps, pipebooms, skid and dozer shovels

INTERNATIONAL INDUSTRIAL POWER

Power to move the earth

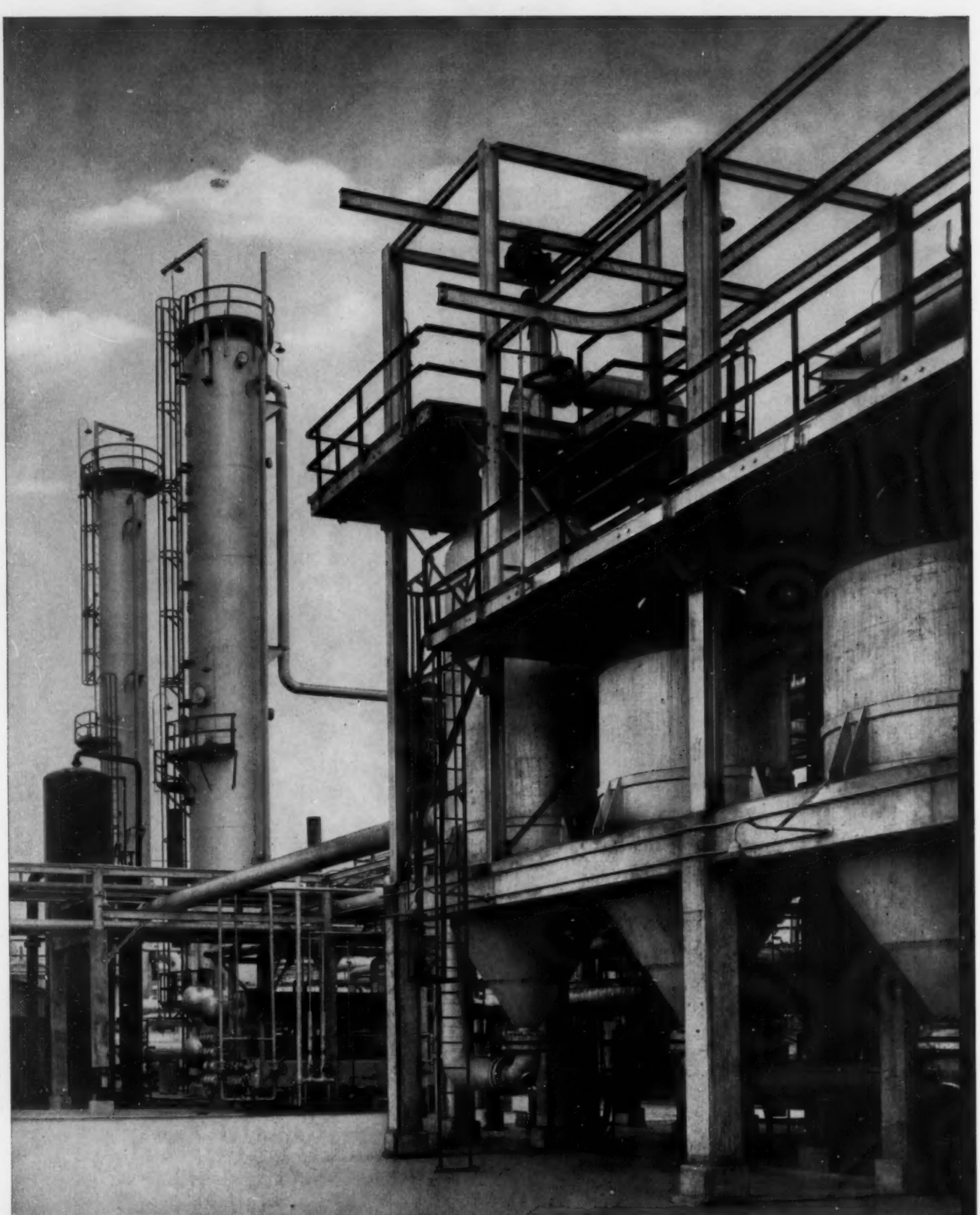
OIL TEAM



There's teamwork in Saudi Arabia.

Successful development of Saudi Arabia's vast oil resources is the result of teamwork among 23,000 Arabian American Oil Company employees. ARAMCO produces almost a million barrels of oil each day.

Aramco ARABIAN AMERICAN OIL CO.
DHAHRAN, SAUDI ARABIA NEW YORK, N.Y., U.S.A.



Reactor Section of the UOP Platforming unit at Republic Oil Refining Company.

Platformer Helps Republic To Meet Changing Market Demands Quickly, Economically

By L. W. Robbie
Vice President and General Manager
Republic Oil Refining Co., Texas City, Texas

ADDITION of a UOP Platforming unit to our Texas City refinery has made it possible for Republic Oil Refining Company to quickly fill demands for a variety of products, thus enabling us to easily meet changing market conditions while at the same time deriving the maximum possible profit from the plant's throughput.

L. W. Robbie

The decision to add a catalytic reforming unit to our processing equipment was made only after we took a long-range look at the industry and decided that important changes in octane requirements and public demand for certain petroleum products and by-products would occur. We chose Platforming because:

(A) Careful comparison of other refiners' operating data, and Platforming's long record of commercially proved experience indicated that it was best suited to our anticipated needs.

(B) We felt the simplicity of the Platforming process would assure trouble-free operation and minimum costs.

(C) It would give us flexibility to switch from production of motor fuel to aromatics without costly revamping of equipment.

(D) In addition to increasing octane numbers, the overall quality of our finished gasoline would be improved in other ways.

Can Switch to Aromatics

Now that the Platformer has given us the flexibility that previously was lacking in our refinery operations, we are in a more favorable position to increase octane numbers quickly should the demand swing upward, or we can switch to the production of aromatics at times when market conditions justify.

The 5,500 B/SD Platformer went on stream last November 12, and it has been operating at capacity since then. Catalyst life reached 73.11 barrels of charge per pound of catalyst on the initial run. So far, we have been producing only motor fuel, with the Platformate ranging up to 89 clear octane and 98½ octane after the addition of 3 cc. TEL. The high quality of the Platformate has enabled us to meet with ease the market demands in our trade territory, which call for 87 octane regular gasoline and 95 octane premium motor fuel.

Universal Oil Products Company designed, engineered and licensed the Platformer. Construction of the unit and revamping of some existing refinery equipment was done by Procon Incorporated.

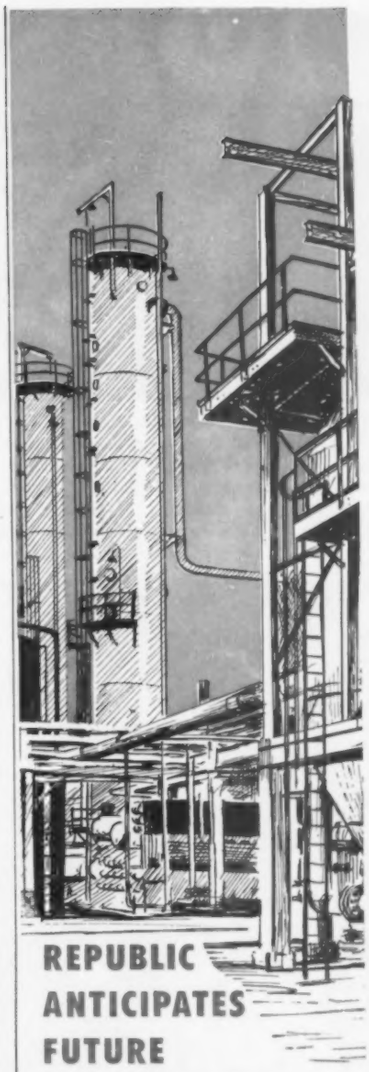
One of the unusual features of the unit is the location of an overhead cooling system for the depentanizer and rerun towers on the roof of an old pump house. The interior of the old pump house was revamped and the Platformer's control panel facilities were placed there. Only one-half of the roof area is occupied by the cooling facilities, thus leaving considerable space for the installation of other equipment should the need arise at some later date for expansion of the unit. A start in this direction was made at the time the Platformer was built by installing a fourth reactor in anticipation of the possible production of aromatics.

21,000 B/SD of Gasoline

Our Texas City refinery can turn out in excess of 21,000 barrels of gasoline per stream day through the combined output of the Platforming unit, a UOP Fluid Catalytic Cracking unit and a UOP polymerization plant. The cat cracker was operated during World War II to produce 100 octane gasoline for the Armed Forces. We conservatively estimate that 85 per cent of our total gasoline production will lead up to more than 95 octane.

Twenty different Gulf Coast sweet crudes are processed in the refinery, which has a throughput capacity of 43,000 B/SD. Charge stock to the Platforming unit boils in the range of 220 to 400° F., and it is a heavy straight run gasoline fraction prepared in a separate fractionation section.

With the installation of the Platforming unit, we have climaxed a long-range program designed to produce the highest quality products which have the broadest marketable range. Our Texas City refinery now is one of the most modern in the country, and the Platformer is playing a vital role in helping us to achieve our goal of making greater volumes of higher quality products from petroleum.



REPUBLIC ANTICIPATES FUTURE OCTANE NEEDS WITH UOP PLATFORMER

designed, engineered and licensed by

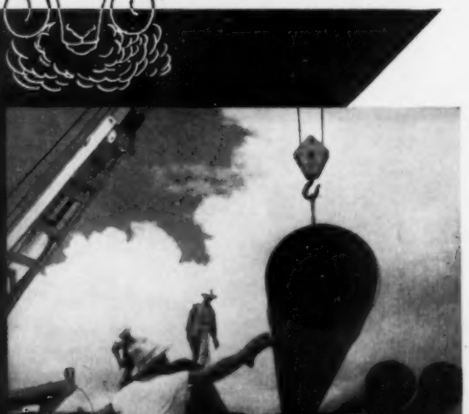
UNIVERSAL OIL PRODUCTS COMPANY

30 ALGONQUIN ROAD,
DES PLAINES, ILL., U. S. A.
Laboratories: RIVERSIDE, ILLINOIS

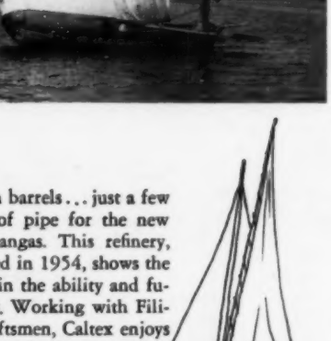
Universal Service Protects Your Investment

BAHRAIN—The contrast of old and new in this colorful shaikhdom is shown graphically here. The Bahraini's lateen-rigged dhow, Bahrain's traditional fishing and pearling craft, sails gracefully through the waters of the Persian Gulf. In the background we see a modern refinery and Sitra Wharf where tankers take on refined oil products for delivery to markets halfway 'round the world.

NEW ZEALAND—Near majestic Mt. Egmont lies New Plymouth, largest city of Taranaki Province. This scenic land is the world's largest exporter of dairy products and lamb, ranks second in exports of wool. Caltex is proud to be a part of this scene . . . glad to help an enterprising country take its place in the modern world.



PHILIPPINES—Not gun barrels . . . just a few sections of the miles of pipe for the new Caltex refinery at Batangas. This refinery, which will be completed in 1954, shows the confidence of business in the ability and future of the Philippines. Working with Filipino engineers and craftsmen, Caltex enjoys the co-operation and good will so vital to such an immense project.



Caltex serves the people of 67 lands

In 67 lands, across half the world, through such developments as these, Caltex is able to supply better fuels and lubricants for industry, for agriculture, and for motoring millions. These require a continual investment of funds and skills, backed by a faith in a better future for free nations.

CALTEX

CALTEX **Petroleum Products**

SERVING EUROPE • AFRICA • ASIA • AUSTRALASIA

DU PONT

PETROLEUM CHEMICALS DIVISION NEWS

DU PONT

October ★ One of a Series of Interest to the Petroleum Industry ★ 1954

No Country Like Our Country!

Each year, during Oil Progress Week, Americans can proudly celebrate the fact that in no other country are the people so well supplied with products and services that can only be made available through a great, progressive and competitive oil industry.

3 New Additives Recently Developed by Du Pont

Progress in the development of new petroleum additives has been rapid at Du Pont during the past year and a half.

The most recent of these is Lube Oil Additive 564. Now, for the first time in the history of motor oil additives, Lube Oil Additive 564 provides a viscosity index improver with effective detergent-dispersant action to overcome sludge problems caused by continuous low-duty stop-and-go engine operation. Its detergent action is also effective under medium and heavy-duty conditions. And Lube Oil Additive 564 is ashless, a unique quality in a detergent.

What's more, this new additive is highly effective in low concentrations and can, therefore, be used at reasonable cost. It is expected that it will prove especially valuable in motor oils used in urban car and delivery truck fleets, as well as in the average driver's car.

Another effective new additive recently announced by Du Pont is Estersil GT—a water-repellent silica grease thickener. This additive makes possible multi-purpose greases with unusually high shear and thermal stability.

Du Pont Fuel Oil Additive No. 2, announced only a little more than a year ago, has already proved its worth as a stabilizer and dispersant for both heating and diesel oils.

SERVICE!...

It has become a symbol of the Petroleum Industry . . . and it is the key policy of the Du Pont Petroleum Chemicals Division

In the language of the American motorist, "petroleum products" and "service" have become almost synonymous.

When the motorist needs gasoline, he looks for a *service* station. When he buys motor oil or chassis lubrication, he refers to his purchase as having his car "serviced." During the past half century, the tremendous growth of the petroleum industry has been built on *service* . . . and the public has benefited richly from it.

A UNIQUE SERVICE for refiners and marketers is the quarterly Du Pont Motor Gasoline Survey. It is based on hundreds of service station samples collected by Du Pont representatives every three months.

At Du Pont, we have designed our services in connection with additives to be outstanding, too . . . and many of these are the kind that stimulate your business at the service station and consumer levels.

Marketing Services

Du Pont Petroleum Chemicals Division services cover a wide range of oil company activities. In marketing, for example, the Du Pont services are designed to fit in with the individual company's own sales promotion programs . . . to help them get *extra* mileage out of their promotion investment.

The recent extensive survey of consumer gasoline buying habits is one example of a Du Pont service that can be equally valuable to every oil company. And the Du Pont brand name, lube oil, and chassis dynamometer presentations can be easily tailored to meet individual marketing requirements. In addition, Du Pont also supplies marketers with a wide variety of dealer-training aids.

Technical Services

As oil technology progresses, new technical problems have a way of constantly cropping up. Since the solution to technical problems generally comes easier and faster when extra information is available, Du Pont makes available a number of widely varied technical services to assist refiners.

For example, our five well-equipped regional laboratories, conveniently located near the major refining areas of the country, work exclusively on oil and automotive industry problems. And the Du Pont fleet of fuel test cars is often called in to help refiners solve

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

OVER

DU PONT

PETROLEUM CHEMICALS DIVISION
NEWS

DU PONT

CONTINUED "Service"

road performance problems. Another unique Du Pont service is the engineering of tetraethyl lead blending plant design and construction.

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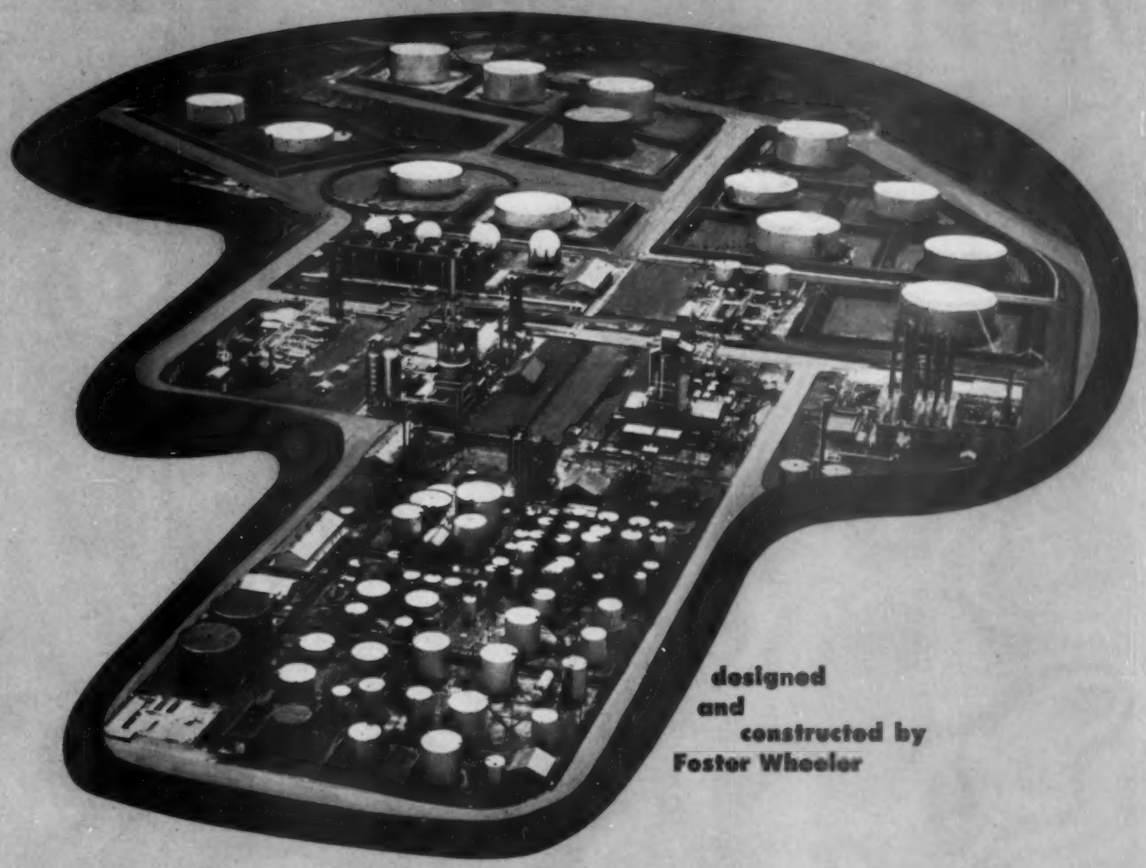

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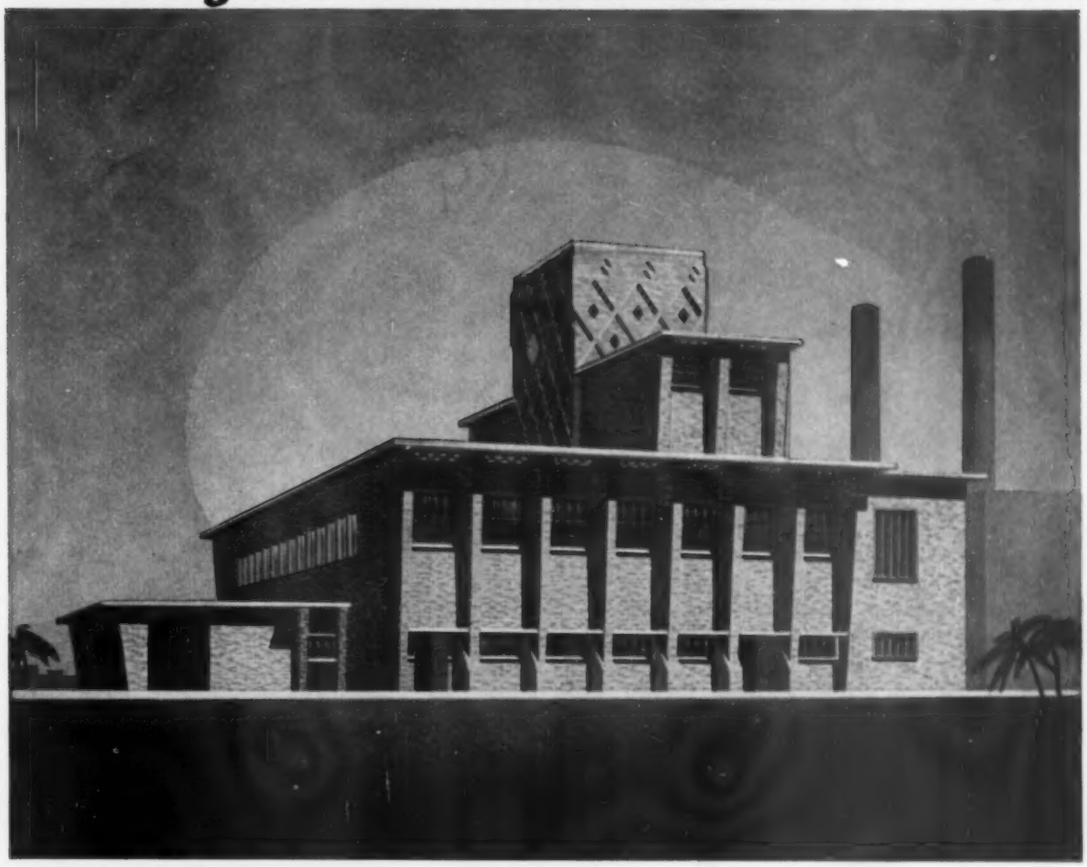

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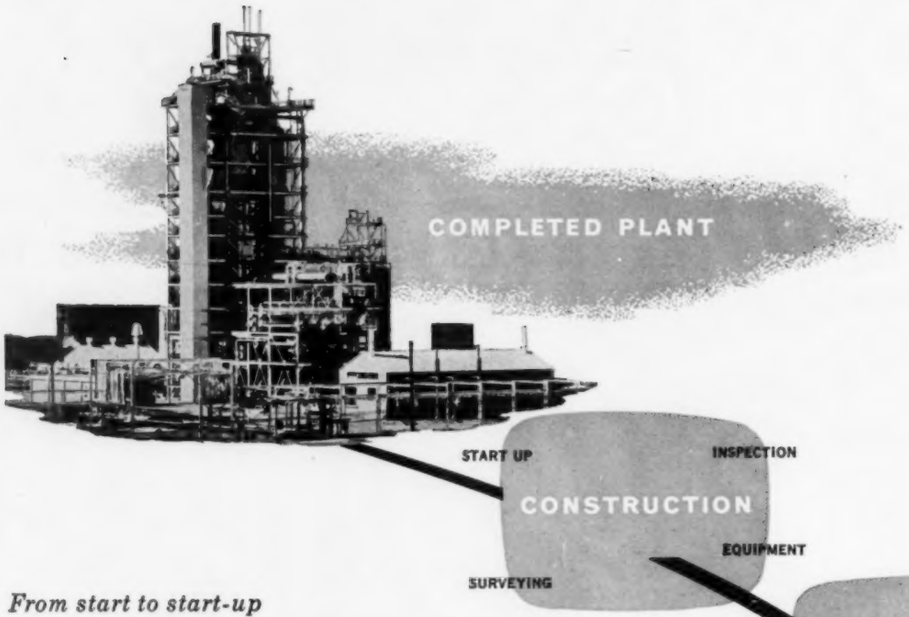

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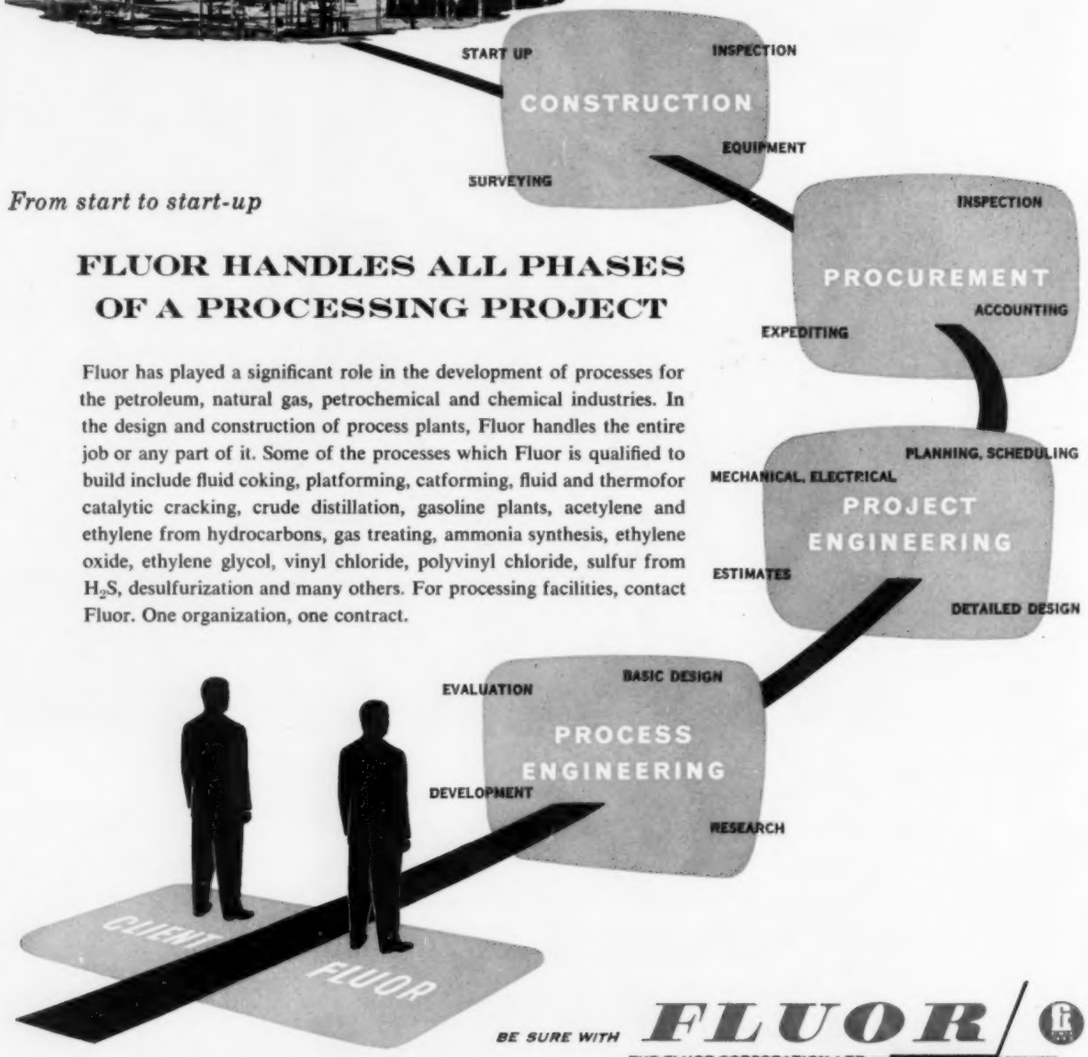

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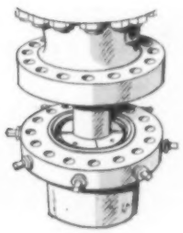

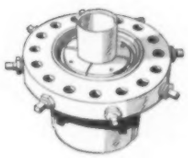

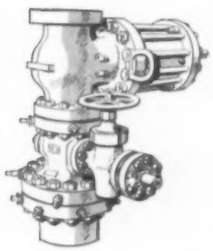

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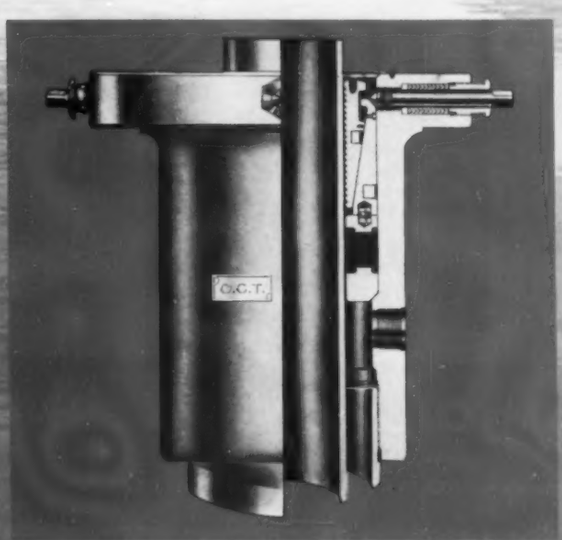

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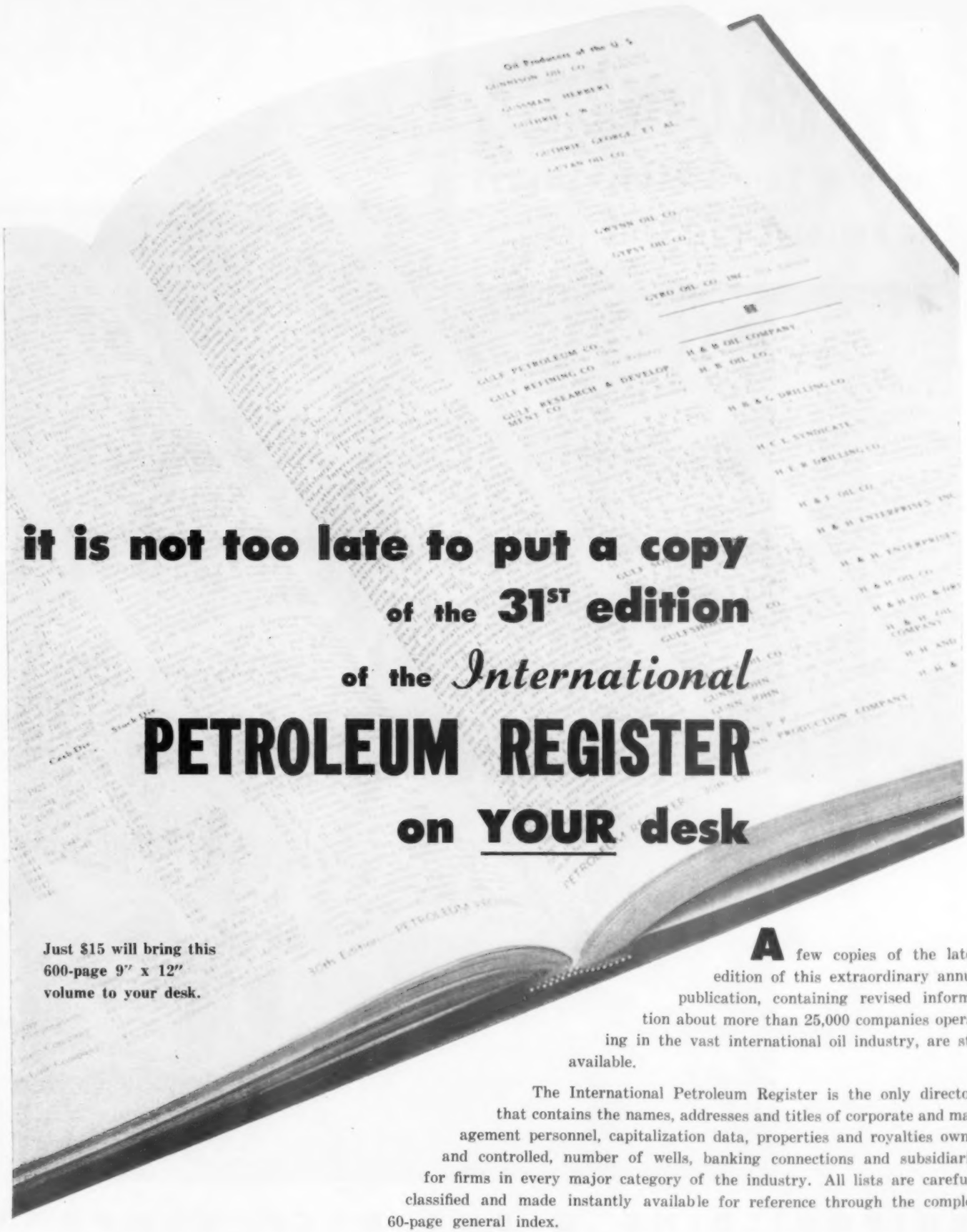

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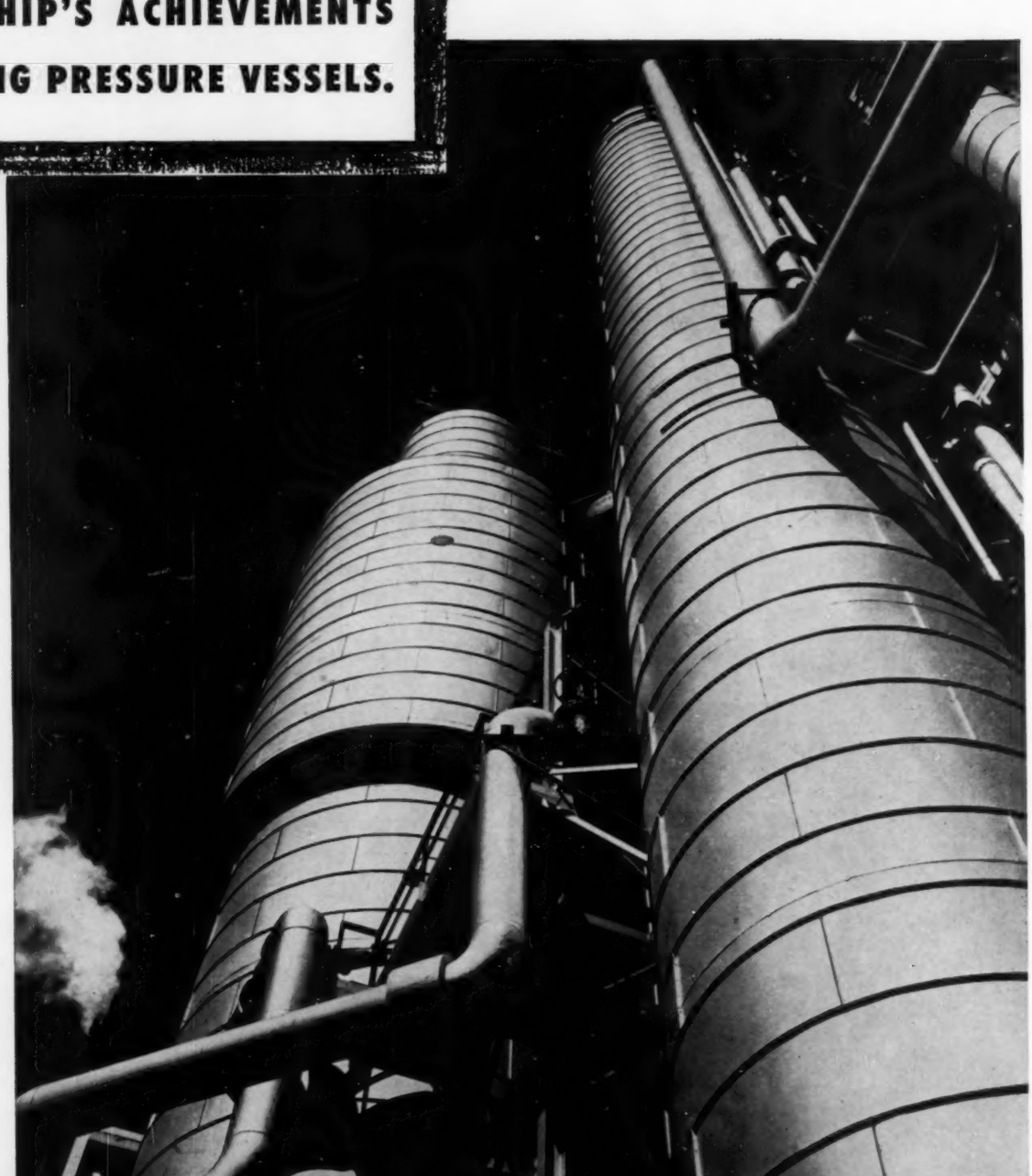

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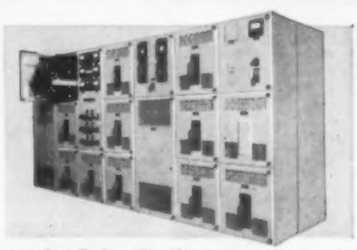

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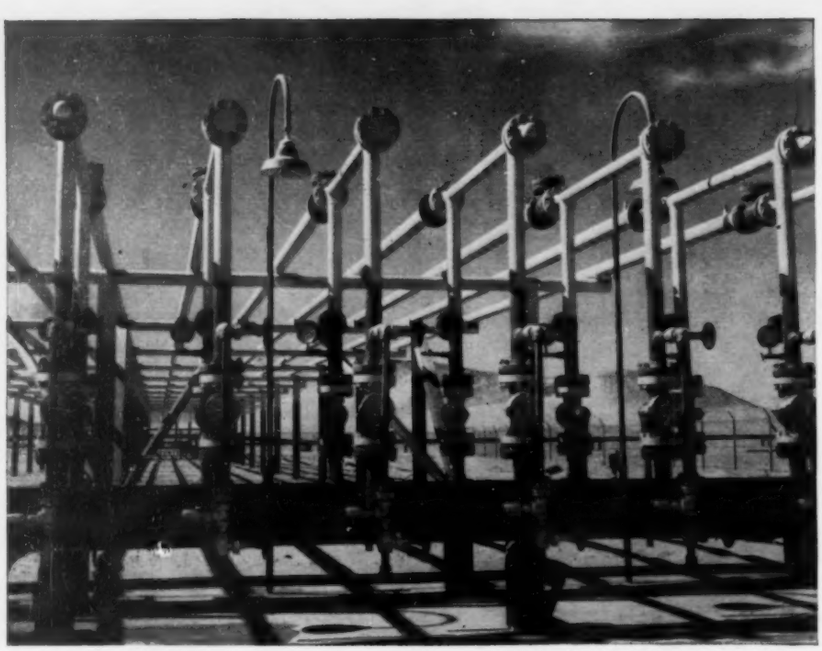

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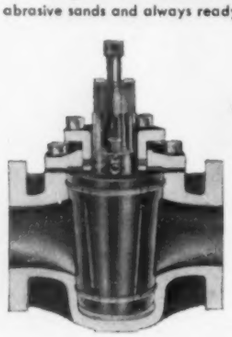

Cutaway view, Standard bolted gland Audco-Nordstrom valve.

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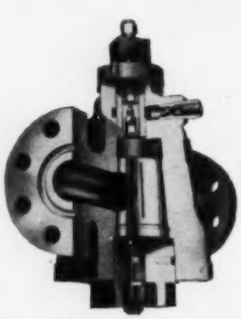

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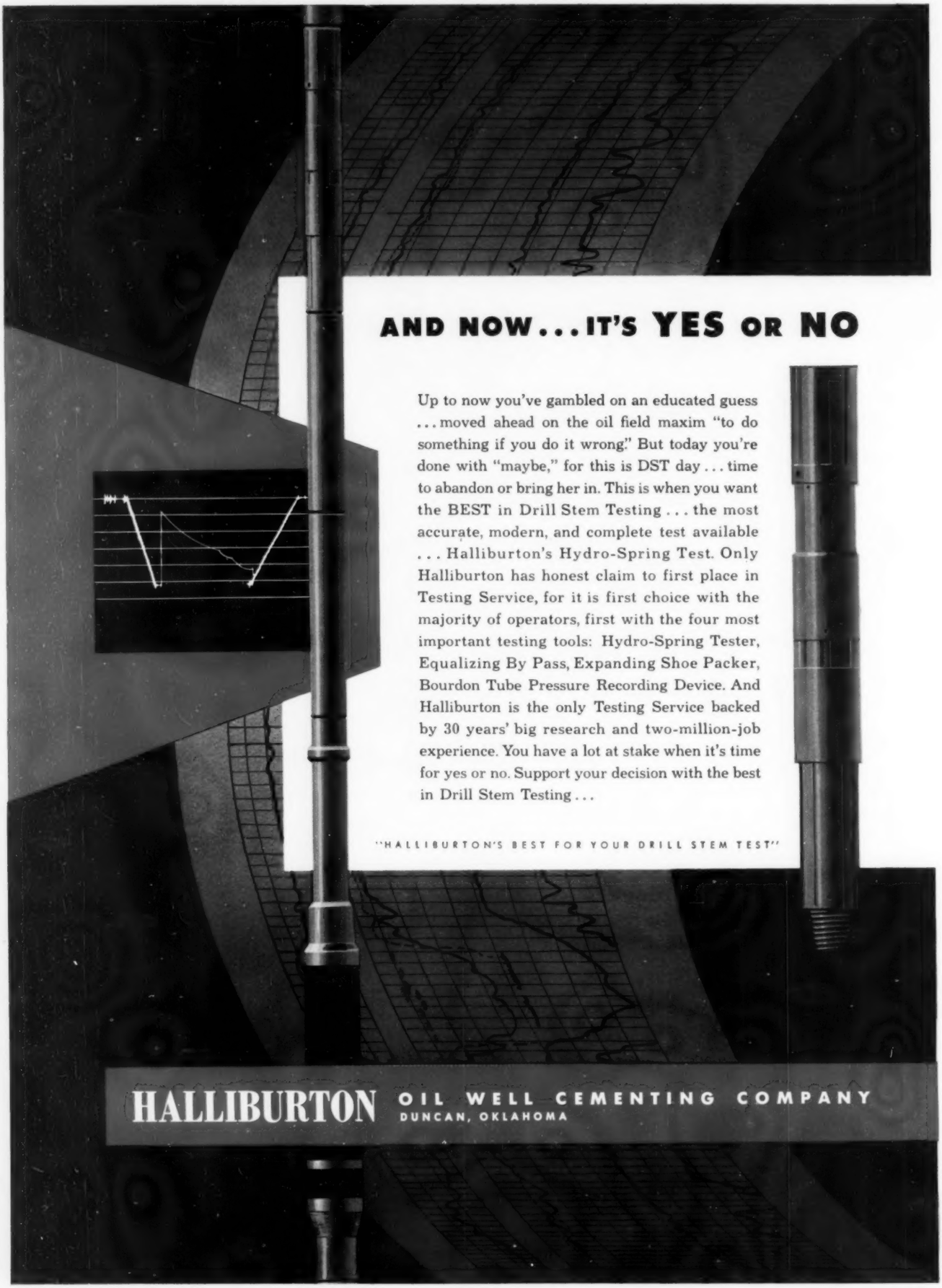
THIS MONTH'S COVER

This splendid impression of tanker loading operations is by artist David Chalmers. Color plates are reproduced through the courtesy of Keith Thomson, editor of ESSO magazine.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Federal policy and the petroleum industry

THE SESSION OF THE Eighty-Third Congress of the United States which adjourned late in August established one record in relation to petroleum that, if not unique, was at least unusual in comparison with a long series of previous sessions. It was the first in which no investigation or series of public hearings by Congressional committees or other government agencies was directed to showing the industry in an unfavorable light.

This is not to say that the industry escaped criticism from the floors of Congress or in the public utterances of other agencies of government. But there was a notable absence of the type of attack upon the nation's second largest business that seeks to acquire cheap political capital by impugning the legality or the propriety of business practices evolved from long experience and shared by petroleum with many other stable and honored businesses. The only action in Washington during the past several months that aroused bitter opposition and charges of unfairness did not emanate from the legislative branch or from a bureaucratic arm of the executive division. It was the decision of the Supreme Court which in effect directed the Federal Power Commission to apply price fixing regulations to intra-state sales of natural gas.

That judicial ukase, by the way, is itself to be made the subject of investigation and probably will lead to legislative action when the new Congress assembles early next year.

On the other hand, the late Congress has to its credit some constructive action in relation to petroleum. In the field of taxation it preserved the depletion percentage which for nearly three decades has contributed greatly to the upbuilding of the nation's oil reserves and has enabled oil men to keep pace with the rapid multiplication of demand for their products. Experience has demonstrated the soundness of the depletion provision which enables the oil producer to charge off 27½ percent of gross income from each producing property in recognition of the fact that petroleum is an irreplaceable natural resource incapable of being reproduced and which, therefore, must inevitably be exhausted in the course of time. Without this deduction it would be impossible for oil operators to meet the heavy expenditure required to find new sources of supply to replace those withdrawn.

Continuance of this basic provision is more than ever essential under present conditions, since the cost of finding a barrel of new oil has more than tripled in the past two decades, while the number and depth of wells that must be drilled to replace a given quantity of crude has increased greatly, a trend that appears certain to continue progressively in the future.

Congress also gave statutory recognition to the optional deduction of intangible drilling and development costs, a practice which has been permitted under Treasury regulations since 1918 and by a concurrent Congressional resolution of 1945.

Other Congressional measures affecting petroleum were those providing for modernization of the tanker fleet, for increasing the area of public lands that can be leased to a single company and approval of a slightly reduced appropriation of funds for the operations of the Oil and Gas division of the Interior Department and for enforcement of the Connolly "hot oil" act.

Effect of the law passed a year ago, at the first session of the present Congress, confirming to coastwise states control of exploration and drilling on waters immediately adjacent to their shores, has been reflected in the increased activity now under way in offshore development. The Secretary of Interior is preparing to offer leases on areas in the Continental Shelf which are under the jurisdiction of the federal government and for which a number of oil companies are ready to apply.

One Washington development of great potential importance to the country's oil and gas industries was the establishment of a presidential committee with Arthur S. Fleming, head of the Office of Defense Mobilization, as chairman and six cabinet officers as associate members, to make a survey of the nation's energy resources and fuel supplies. The cabinet members of the commission include the heads of the State, Defense, Justice, Interior, Commerce and Labor departments.

The committee is directed to conduct its studies from the viewpoint of strengthening the national defense while providing for orderly industrial growth, assuring supplies necessary to an expanding national economy and adequate for any future emergency. It is to submit its report to the President by December 1.

J. M. Wanenmacher became a field geologist for South America Gulf Oil Co. in 1926 and spent two years in Colombia and Venezuela before being made assistant chief geologist of Gulf's foreign branch at New York. In 1932 he joined the Shell Oil Co., and for the next 12 years he engaged in various geological and engineering activities for the company with special attention to the mid-continent fields. He spent six months at the Hague in 1939 to advise parent company officials on United States activities. Since 1945 Mr. Wanenmacher has been engaged in consulting petroleum engineering activities with C. H. Keplinger.

C. H. Keplinger did his undergraduate work in physics at the University of Tulsa, and during his summer holidays worked in Oklahoma and Texas fields for Shell, Amerada and National Tank. He took postgraduate work in Germany and his M. S. in physics from George Washington University. In 1933 Mr. Keplinger joined Shell Oil Co. as an engineer trainee. For the next 11 years he was engaged in production engineering in various fields. His work embraced secondary recovery, well spacing, reservoir engineering, production and valuation problems from Texas to Michigan. He was Oklahoma division engineer until 1944.

AUSTRALIAN oil possibilities

By J. M. Wanenmacher and C. H. Keplinger

EXPLORATION FOR OIL and gas has been under way in Australia during the past half century, but the results have been discouraging until recently. The continent has been investigated by geologists of many of the larger oil companies from time to time, but their conclusions were generally unfavorable. About 1937 Shell Oil Co. obtained a large concession in Queensland and conducted considerable geologic and geophysical work. This company lost interest when a test well completed shortly after World War II was a failure. With this exception, the past exploration has been done almost entirely by Australian interests. Test wells were located without consideration of geological features. Drilling technique and supervision were generally of very poor quality. Nevertheless, sufficient showings were encountered to encourage further testing by Australians, many of whom possess that gambling instinct so characteristic of the American wildcatter.

In December of 1953 a substantial amount of good quality oil was recovered from Cretaceous strata during drill-stem tests at a depth of 3,600 feet in a well being drilled by Caltex and Ampol on the Rough Range anticline. This test is near the extreme western end of the continent about 650 miles north of Perth. Drilling operations are continuing to an agreed depth of 11,000 feet and another showing of oil has been reported in Permian strata at a depth of about 9,800 feet.

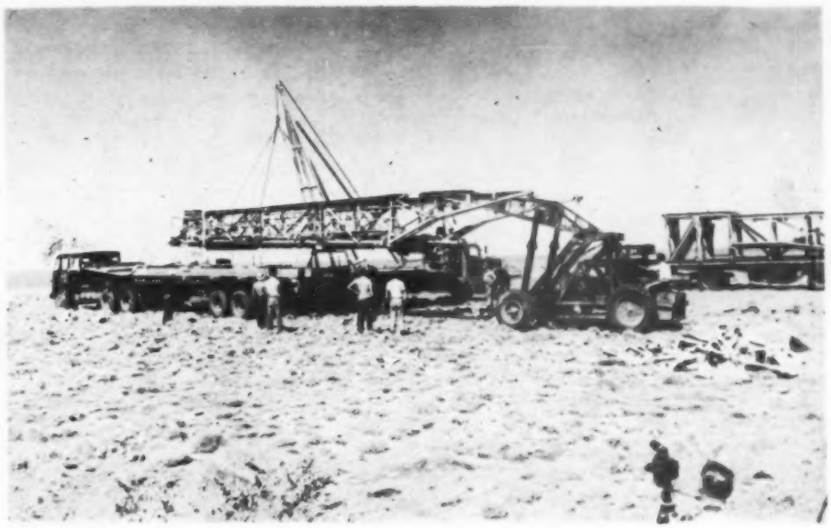
This promised to be the first important discovery of oil in Australia and interest in the continent soared to new heights. Ampol announced in May that upon successful completion of the Rough Range test the operators will spend £10,000,000 Australian ($22,500,000) on development of this prospect.

The same operators recently completed a second test as a dry hole approximately one and one-half miles southwest of their first test. It encountered water in the Cretaceous sand at about 3,700 feet which had yielded a substantial showing of oil in the first test. The management has announced that this result will require revision of the future development plans. Locations for several new tests in various parts of the country have been announced. These include the following:

1. Caltex has started a test well approximately 1,000 miles northeast of its Rough Range well.
2. Australian Associated Oil Fields will drill a deep test about 150 miles southwest of Darwin.
3. This same company is now completing a gas well near Roma in Queensland.
4. An Australian corporation will drill six tests near Sydney.
5. Lucky Strike Oil Company will soon start a deep test near Maryborough about 400 miles north of Brisbane.

The mineral rights in Australia are owned by the Crown. Concessions for oil and gas (or other minerals) are obtained from the State Governments. The writers are familiar only with Queensland's policy in issuing oil and gas concessions. The past policy of this state has been to issue large concessions if requested and some of the present concessions include as much as 18,000 square miles. Concessions are for a period of five years and provide that a substantial portion be released each year. Productive portions may be retained as long as they produce and are subject to 10 percent royalty. Concessions are issued only to responsible parties. A nominal payment is required when the concession is granted. The grantee is required to spend a certain sum each year on exploratory work and to submit geological reports annually. Complete information on all geological and geophysical work as well as drilling information must be submitted to the state. The Mining Department has the responsibility of granting the concessions, enforcing their terms and enforcing oil and gas regulations.

The geology of Australia is not particularly favorable for oil and gas. Approximately one-half of the continent consists of metamorphosed Paleozoic sediments and pre-Cambrian complex. However, many sedimentary basins are present. Most of these are relatively small and occur in the coastal areas. The sedimentary series in many of these basins is relatively thin and some have little or none of the marine sediments considered as a requisite by many geologists for generation of oil. Furthermore, in many



The major units of the National T-32 rig were uncrated soon after the rig arrived at this location in Rough Range. The cantilever telescopic mast is pictured here being lifted off the truck which hauled it from Perth to Exmouth Gulf. Photos courtesy Caltex.

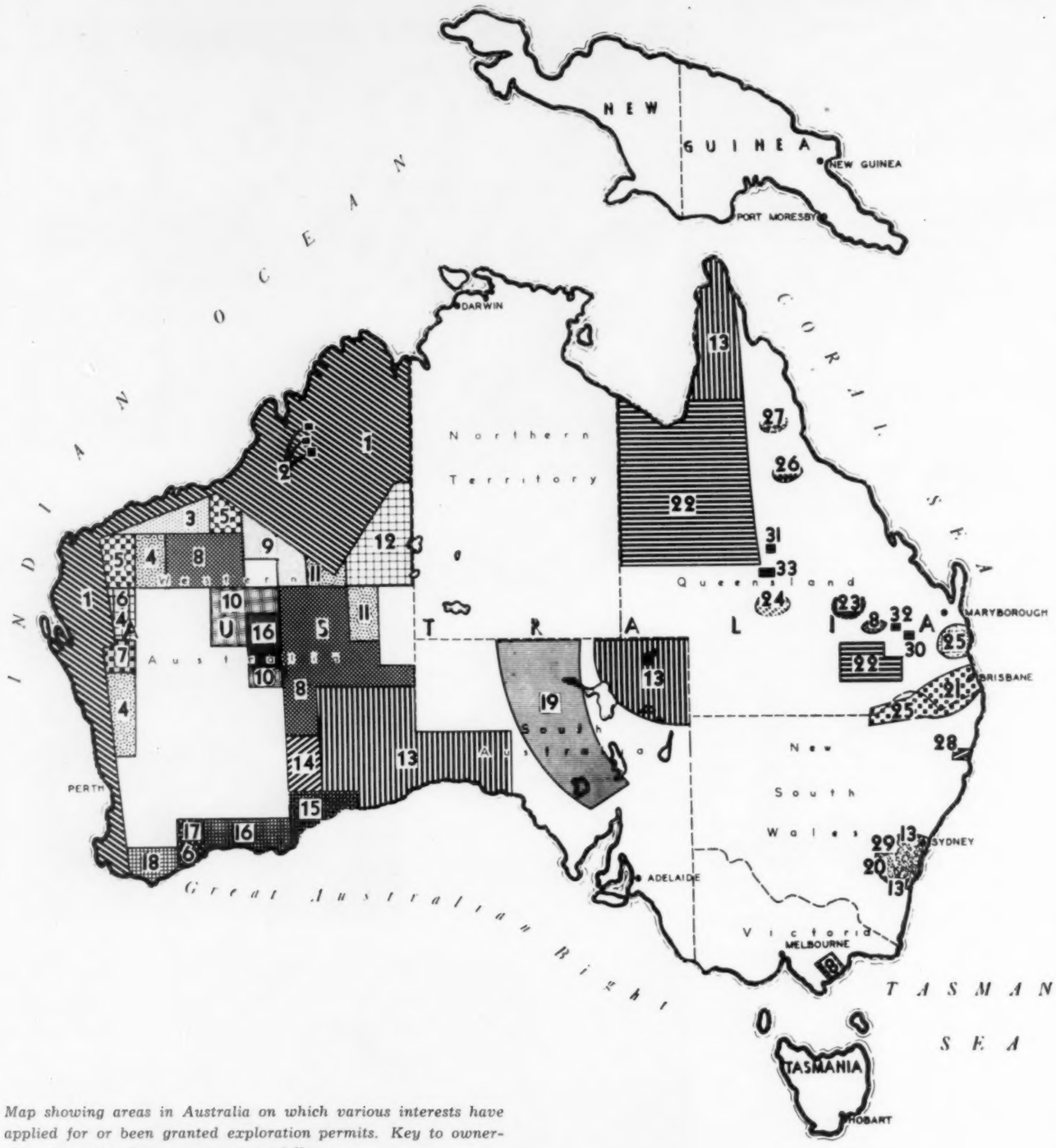
The movement of the prime units of a 200-ton drilling rig from Perth to the oil exploration site at Exmouth Gulf was the biggest overland transport job to be performed by a private company in Western Australia. The shipment was a project of West Australian Petroleum Pty. Ltd. (WAPET) jointly owned by the California Texas Oil Co. Ltd. and Ampol Exploration Pty. Ltd. The T-32 drilling rig was part of the new equipment brought to Rough Range, where last year WAPET brought in a wildcat well.

The 16-vehicle convoy took just over 7 days to complete the journey of almost 900 miles through kangaroo and emu country where roads were often nothing more than tire tracks.

Completely self-contained, the convoy included a fuel truck, a kitchen truck, and a mobile cooker. In isolated areas, stockmen and their families gathered to inspect the odd looking vehicles transporting the rig.

This early morning scene shows the convoy carrying the National T-32 rig from Perth to Exmouth Gulf fueling up in preparation for the long journey ahead. The convoy was then at Wongan Hills, where camp was made the first night out from Perth.

This flock of sheep seems quite unconcerned about the convoy carrying the oil drilling rig. The big trucks were halted at Bullara Homestead (a sheep station) 26 miles from Rough Range when these sheep turned and walked through the gap between the vehicles. The lead vehicle in the convoy is that of a local contractor, which is carrying the substructure.



Map showing areas in Australia on which various interests have applied for or been granted exploration permits. Key to ownership of permits shown on map is as follows:

1) West Australian Petroleum Pty. Ltd.
2) Freney Oil Co.
3) J. A. Mazza
4) North West Oil Syndicate
5) Greenhill Oil Syndicate
6) Atom Minerals and Oil Ltd.
7) Westralian Goldmining Syndicate
8) Australasian Oil Exploration Ltd.
9) Esperance Oil Syndicate Ltd.
10) J. S. Lucy
11) Gold and Mineral Exploration Ltd.
12) Carnegie Syndicate
13) Frome-Lakes Pty. Ltd.
14) Kitchener Oil Development Ltd.
15) Goldfields Petroleum Discovery Syndicate
16) Apex Oil Syndicate
17) Abo Gold Explorations and Flotations Ltd.
18) Jackson Exploration Syndicate
19) R. F. Bristowe
20) Australian Oil and Gas Corp. Ltd.
21) Winneills Pty. Ltd.
22) Associated Australian Oilfields N.L.
23) J. P. McCosh
24) Westlands Oil Co.
25) Oil Drilling and Exploration Ltd.
26) J. Bonython
27) E. Broadhurst
28) Clarence River Oil Exploration N.L.
29) Oil Search Ltd.
30) Condamine Oil Co.
31) T. P. Crosbie
32) Murilla Oil Ltd.
33) J. McD. Royle

areas the sediments contain volcanic material in the form of agglomerates and lava flows. Various types of intrusive igneous rocks are also associated with the sediments in some of the basins. Marine Tertiary beds, which supply almost all of the oil in the nearby East Indian islands, are poorly developed on the continent of Austrialia. Consequently, it is easily understood why the large oil companies have preferred to devote their efforts to the nearby East Indian islands

where great thicknesses of Tertiary sediments are present in large geosynclines.

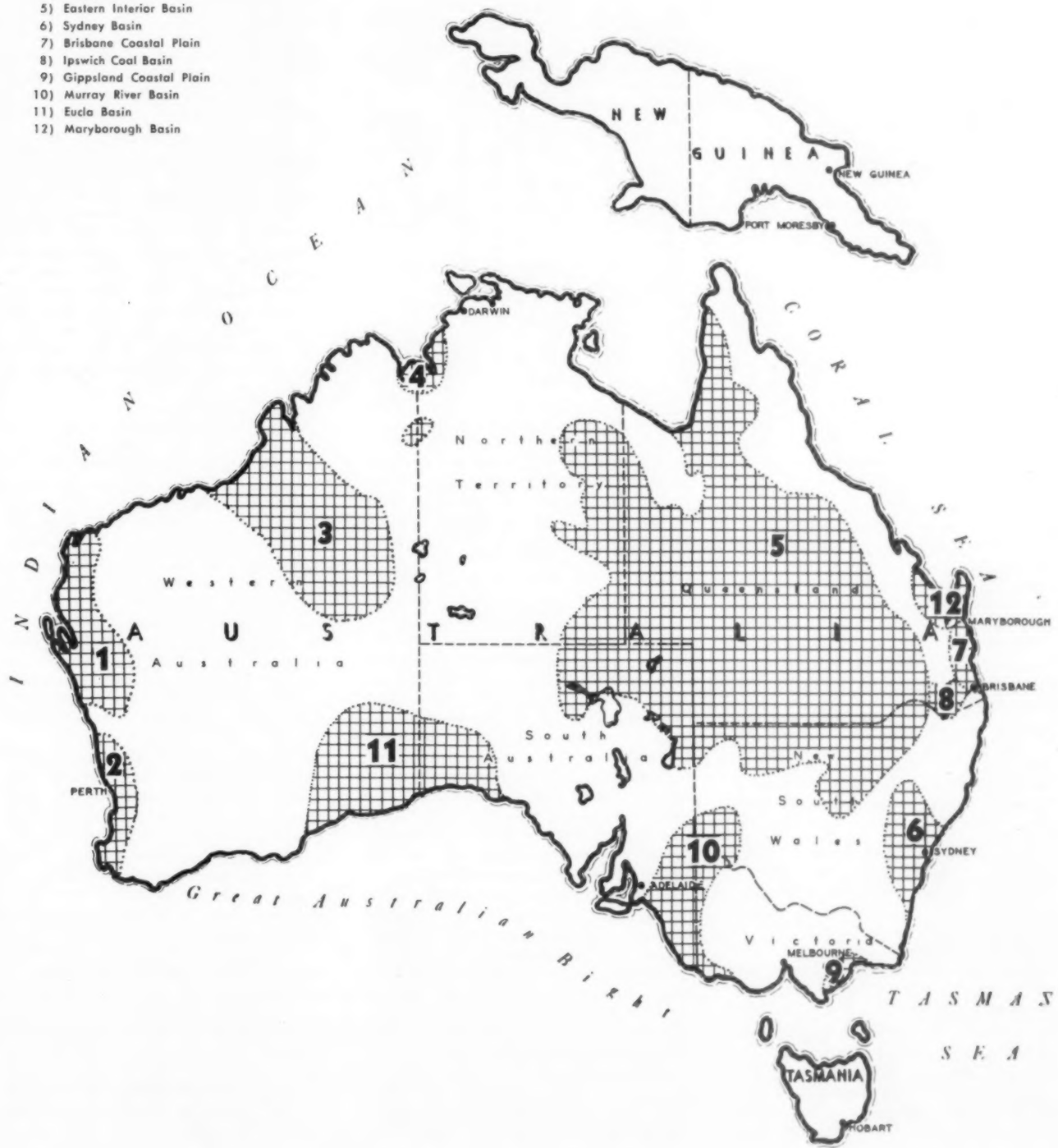
The geologic basins and coastal plains of Australia are shown upon an accompanying map. They are summarized briefly as follows:

1. Northwest Basin: This basin, which is along the western coast of the continent, has an area of approximately 45,000 square miles. The total thickness of sediments, which are dominantly marine, is estimated to be about 18,000 to 20,000 feet. They consist of strata of Tertiary, Cretaceous, Permian, Carboniferous and Devonian age. The Paleozoics comprise approximately 16,000 feet of the sediments. The recent discovery of oil by Caltex which promises to be quite important was in this basin.

2. Coastal Plain Basin: This basin is a

Map below shows geologic basins and coastal plains of the Australian sub-continent. They are indicated by number as follows:

1) Northwest Basin
2) Coastal Plain Basin
3) Desert Basin
4) Bonaparte Basin
5) Eastern Interior Basin
6) Sydney Basin
7) Brisbane Coastal Plain
8) Ipswich Coal Basin
9) Gippsland Coastal Plain
10) Murray River Basin
11) Eucla Basin
12) Maryborough Basin



short distance south of the Northwest basin and is separated from it by an uplift. The Coastal Plain basin has an area of approximately 14,000 square miles. The total thickness of sediments is about 7,000 feet. The strata are of Cretaceous, Jurassic and Permian age. The latter comprise slightly more than one-half of the total thickness. The strata younger than the Permian are dominantly of marine origin. The Permian contains a large proportion of non-marine beds including continental sands, coal measures and glacial deposits.

3. Desert Basin: This basin is also on the western coast, but extends inland a considerable distance. In fact, its long dimension is at right angles to the coast line. It has an area of about 140,000 square miles and the maximum thickness of sediments is about 9,000 feet. Strata of Lower Cretaceous, Jurassic, Permian, Carboniferous, Devonian and Ordovician age are present. Much of these sediments are non-marine, especially the younger ones. A large part of this basin is an unexplored desert. Caltex is drilling a well in this basin.

4. Bonaparte Basin: This basin is on the northwest coast about 150 miles southwest of Darwin. It is a small basin with an area of about 7,000 square miles. The thickness of sediments is about 11,000 feet. The strata are of Lower Cretaceous, Permian, Carboniferous, Devonian and Cambrian age. The sedimentary series is dominantly marine. Australian Associated Oil Fields has announced that it will drill a deep test in this basin.

5. The Eastern Interior Basin: This basin is the largest in Australia and has an area of about 700,000 square miles. It includes a large part of Queensland, the northern portion of New South Wales, the northeastern portion of South Australia and the eastern portion of Northern Territory.

This basin includes the large Artesian basin of approximately 600,000 square miles which supplies artesian waters mainly from sandstones of Jurassic age. It also includes areas adjacent to the Artesian basin where substantial thicknesses of unmetamorphosed Permian or Cambro-Ordovician sediments are present.

This Eastern Interior basin has been explored more than any single area in Australia. A few gas wells were completed near Roma and there is current exploration. Oil has not been found in commercial amounts. Shell made a detailed study and conducted geophysical work near the central part of this basin. Their efforts terminated after completion of their first test well as a dry hole.

The thickness of sediments is approximately 8,000 feet. The strata are of Tertiary, Cretaceous, Jurassic and Lower Paleozoic age. Throughout most of the basin a large thickness of Permian beds occurs near the east central edge of this basin and a substantial thickness of Cambrian and Ordovician beds is present near the west central edge.

6. Sydney Basin: This basin has an area of 8,000 square miles. The sediments are of Triassic and Jurassic age and have a thickness of 9,000 to 15,000 feet. Several pronounced structures are present. The Triassic strata are non-marine. The Permian strata consist of coal measures and two series of marine origin. The Permian is underlain by Paleozoics which are so metamorphosed and intensely deformed that they are included in the basement complex. Several tests have been drilled in the Sydney basin, but encountered no showings other than methane gas. An Australian company has announced plans to drill six tests in this area.

7. Brisbane Coastal Plain: North of Brisbane is a strip of coastal sediments ranging from six to twenty miles in width and about 100 miles in length. These are of Triassic and Jurassic age and have a maximum thickness of about 7,000 feet. The dip is eastward, but details of local structure are not known.

Two wells near the northern end of this coastal strip reported showings of gas at shallow depths and a test on the coast at the southern end encountered strong showings of oil in Triassic strata at a depth of 2,240 feet.

8. Ipswich Coal Basin: Immediately west of Brisbane is a basin with an area of approximately 10,000 square miles. The strata, which are of Triassic and Jurassic age, have a total thickness of about 10,000 feet. They consist of two coal series with a thick intervening sandstone formation of continental origin. A few deep tests and several shallow ones have been drilled in this basin. Several have reported showings of gas and a few reported small showings of oil.

9. Gippsland Coastal Plain. This coastal plain is on the southern coast of the continent a short distance east of Melbourne. It has an area of about 2,000 square miles. The sediments are of Tertiary age and have a maximum thickness of about 2,500 feet.

Several wells have produced small amounts of oil from a shallow sand. The oil was invariably accompanied by large amounts of water. A few thousand barrels of oil have been produced, but the operations were very unprofitable.

10. The Murray River Basin: This basin, which is on the southern shore of the continent, has an area of about 90,000 square miles. The maximum thickness of sediments is approximately 10,000 feet. Strata of Tertiary and Jurassic age are represented. The Tertiary series contain considerable marine strata, but the Jurassic is largely non-marine.

11. Eucla Basin: The Eucla basin has an area of about 50,000 square miles. The thickness of sediments is small, amounting to less than 2,000 feet. These are of Miocene and Lower Cretaceous age and are mostly marine.

12. Maryborough Basin: This basin is on the eastern coast of the continent about 400 miles north of Brisbane. It has an area of about 4,000 square miles. The sediments have a total thickness of about 20,000 feet and are of Cretaceous, Jurassic, and Triassic age. A considerable portion of the Cretaceous beds are marine, but the other strata are almost entirely non-marine with two coal series and one thick sandstone series of continental origin. Lucky Strike Oil Co. has announced that it will drill a deep test in this basin.

The continent of Australia has been in general a positive element during much of its history. It has been affected by strong movements which have resulted in folded mountains with considerable faulting. These folds are in general near the present coasts and parallel to these coasts. There has also been considerable igneous activity, both extrusive and intrusive.

Deformation has been somewhat more pronounced in the eastern part of the continent. This portion experienced deformation and igneous activity near the close of Paleozoic time. As a result, the Paleozoic sediments are so highly deformed and metamorphosed that they offer little possibilities of oil production throughout most of Eastern Australia. In Western Australia their possibilities are more attractive.

Large pronounced anticlinal structures are present in the basins in Western Australia. The large Eastern Interior basin has a few known anticlinal structures. These are mostly rather gentle folds but more pronounced folds are present on the eastern part. The Sydney basin also has several anticlines and domes, some of which are rather large. The Ipswich Coal basin has one large anticline and several smaller ones. The Maryborough basin has three rather large anticlinal structures. The other basins and the coastal plains of the southern and eastern coasts have few known structural features favorable for oil accumulation.

In conclusion, the geological factors indicate that about one-half of the continent is occupied by strata of the basement complex which are definitely unfavorable for oil and gas. The remainder has possibilities. Most of the coastal plains and basins on the southern and eastern coasts are in general less favorable than those in America because they lack the combination of thick sedimentary series with appreciable content of marine beds considered necessary by most geologists for generation of oil and gas and the structural features necessary for accumulation. The basins of the west coast of the continent are considered more attractive. This conclusion, incidentally, was reached by geologists before the recent discovery of oil in this part of the continent.

Oil discovery encourages Formosa

By C. R. Meissner, Jr.*

WHILE FORMOSA has never figured in any conspicuous way in the petroleum industry, a discovery made there in the early part of 1954 bids fair to prove of considerable importance to the people and government of the island. This is the well designated as Chutouchi No. 8, drilled by the Chinese Petroleum Corporation. It was brought in from a Miocene sandstone formation at a depth of 2,657 feet and gave an initial production of 65 barrels per day.

While the well is a modest performer in volume of yield, the crude produced is of excellent quality. It is of paraffin base with a high gasoline content. The discovery has created a wave of intense interest in this island stronghold where free China's army under Generalissimo Chiang Kai-shek is holding out. It has led to feverish activity on the part of the Chinese Petroleum Corporation in preparing to drill an offset to the original well. If, as is generally hoped, further tests establish the existence of a fair-sized field, it will be of assistance in solving Formosa's petroleum problem as the oil needed to feed the island's one refinery now must be imported, being brought in from Pacific areas.

The location of Chutouchi No. 8 is an unusual one, being a tightly folded anticline which forms a very steep-sided mountain covered with a thick growth of jungle vegetation. The spectacle of a full-fledged drilling rig perched on a small platform cut into the mountainside high above the valley floor is an impressive one viewed from below.

The combination of exceedingly rough terrain with precipitous grades, no roads and a jungle growth so dense as to be almost impenetrable, made the work of preparing the drilling site and moving in equipment extremely difficult.

As a first step in site preparation, a surveying party blazed a path through the tangled growth, placing stakes and markers. Then the wood cutters chopped away the trees, vines and bushes, making a clearing along the route previously marked out. They were followed by the diggers and blasters throwing in fill, hand drilling rock and breaking it up with charges of dynamite to establish a graded right of way. Trestles were built over ravines.

Following this preparation, ties and rails were laid for narrow gauge inclined railways extending up slopes with grades up to 50 degrees. Up and down these inclines small cars pulled by power-driven cables hauled men and equipment for the work of drilling.

On the mountain top other railways were built along the level stretches between the inclines. Over these lines strings of loaded cars are pulled by water buffalo, faithful and powerful work animals of the Far East. In order to move machinery into position, it was necessary, of course, to dismantle it into the smallest possible parcels so that workmen could carry the pieces and hand load them into the cars. When the materials were all delivered on location, they had to be reassembled before drilling could begin.

In this laborious fashion, Chutouchi No. 8 was drilled and brought in its modest but encouraging contribution to the petroleum supply of Formosa. This discovery has served to raise high hopes that it may lead to the development of a field capable of supplying a substantial part of the island's petroleum requirements.

Storage tanks have been built and pipe lines set to convey the crude produced to the valley floor. From the loading station at the foot of the mountain tank trucks will move the oil over a rough country road to a railway line where it is transferred to tank cars and transported to Formosa's only refinery at Kaoshiung.

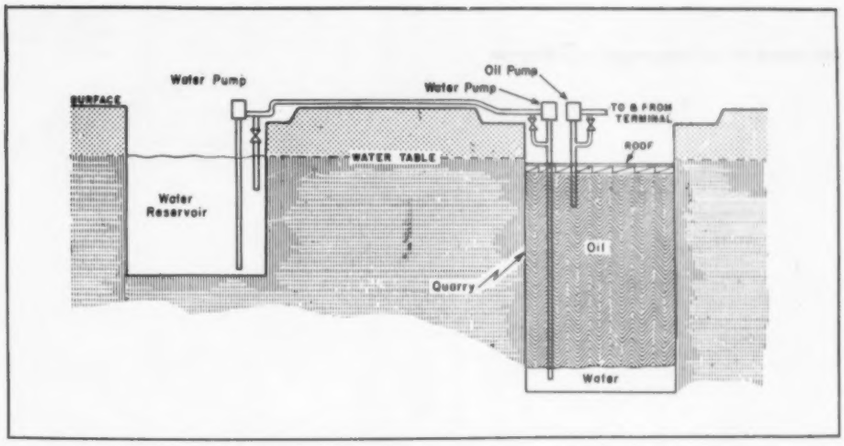
This refinery, badly damaged during the war, was reequipped in 1947 and has a daily capacity of 18,350 barrels with cracking equipment to handle 6,500 barrels per day. It is operated by the Chinese Petroleum Corp. and a projected enlargement will include the addition of a feed preparation and gas recovery unit of 10,000-barrel daily capacity and a Thermofor catalytic cracker of 6,500 barrels capacity.

Until now, the plant has had to depend upon imports for its crude supply, but if domestic production can be increased, it will, of course, improve the refinery's position.

*Petroleum Engineer, Foreign Operations, Administration, Mutual Security Mission to China.

Steel pontoons, weighing almost three tons each, form a 56,000 square foot floating roof for a slate quarry in Wind Gap, Pa., which Esso Standard Oil Co. will use for seasonal storage of heating oil.

Employ abandoned slate mine for fuel oil storage



A diagram of Esso Standard Oil Company's unique seasonal storage operation at Wind Gap, Pa. Oil is pumped in at the surface of the quarry on the right as water is withdrawn at the bottom to accommodate it. The procedure is reversed when oil is withdrawn. The pressure of the surrounding water table on the outside of the quarry, being greater than the pressure of oil, effectively seals the oil in the quarry.

ESSO STANDARD OIL CO. recently began filling an abandoned slate quarry in Eastern Pennsylvania with domestic fuel oil. The mine will store up to a million barrels of distillate fuel for the peak winter market. It is to be filled, by pipe line from the Linden, N.J., refinery some 65 miles away.

The Esso project is the first attempt in the United States to utilize the oil storage potential of idle mines and quarries. It is similar in principle to an installation in Sweden,[1] in that a water table is employed to prevent loss of product from an unlined vessel with permeable walls. The mine in Sweden has successfully stored a million barrels of oil without loss to the formation.

Previous underground storage projects in the United States have been washed out of salt beds or especially excavated in shale or hard rock formations for the storage of liquefied petroleum gases for which the cost of steel storage is high. Propane tankage costs about $15 per barrel, whereas salt caverns can be washed out for about $1 per barrel and shale cavities excavated about $5-$10 per barrel.

The seasonal factor in distillate sales is quite similar to that of propane. In the case of domestic fuel oil, the ratio is nearly three to one. This year January refinery shipments totaled 75 million barrels, while June deliveries were only 27 million barrels. The urge to go underground for storage of furnace oil is far less than in the case of propane because steel tankage for a product which need not be kept under pressure can be installed at about 75 cents per barrel, less than the cost of washed out salt storage.

The Esso storage venture has cost $500,000, or 50 cents per barrel to get ready for operation. This low figure was obtained because an open pit has been used which required little or no excavation. It was only necessary to clear away loose material around the upper edges of the quarry and on the bottom. Largest cost element was the steel roof. The company is not sure at this time whether operational costs will be low enough to make the venture attractive when compared with tank farm steel storage. A year or more of experience will be necessary to develop facts.

Some elements in the cost of operating underground storage are much lower than steel storage. Maintenance charges should be less and insurance companies allow lower rates. With the cost of construction only two thirds that of steel, depreciation will be a smaller charge.

Against such savings must be charged the cost of pumping product from refinery to storage and returning the oil to loading racks. The Esso storage at Wind Gap, Pa., requires pumping the distillate 65 miles through a 6-inch line leased from Tide Water Associated Oil Co. Supervision and return pumping also must be charged against the operation. The pipe line passed within 1,500 feet of the quarry, so cost of extension was small.

On the assumption that this type of storage will be economic, Esso has purchased or obtained options on nine abandoned quarries in the vicinity of Wind Gap, some 75 miles from New York City. The mine could provide storage for eight million barrels of additional oil. There are a large number of other excavations which could be similarly used in eastern states.

An accompanying photograph shows the quarry before construction was begun. The walls were found to be relatively smooth when water was pumped out, so that no work was necessary to dress them except at the surface where loose material was excavated. The pit itself has an area of about 56,000 square feet and is 225 feet deep. The companion quarry used for water displacement storage is somewhat smaller.

The quarry is covered with a sectional pontoon roof which floats on the liquid. The roof is constructed of 240 pontoons. Each section is fabricated with a 3 to 4-inch vertical flange which is clipped to its neighbor with a metal strap and then tack welded.

While the roof floats on the surface of the liquid, it is not contemplated that the vertical movement will exceed two to three feet. Water will be employed to keep the level nearly constant whether the quarry is full of oil or empty.

Lateral movement of the roof is restrained by nine cables attached to the under side with coil springs and anchored to the walls of the quarry.

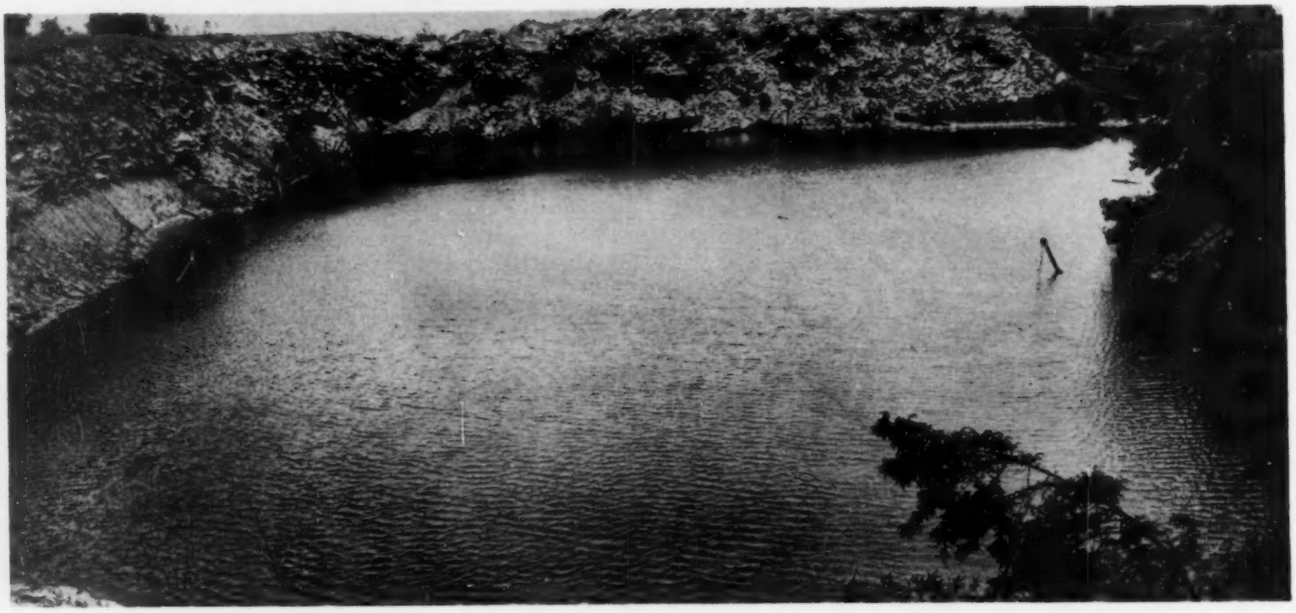
Edges of the roof are protected against falling debris and wild life by a neoprene curtain which hangs from a three-foot metal shelf surrounding the quarry. The curtain is long enough to maintain contact with the roof surface throughout its range of movement.

Roof drainage is provided through each of the 250 pontoons. Water is permitted through the oil.

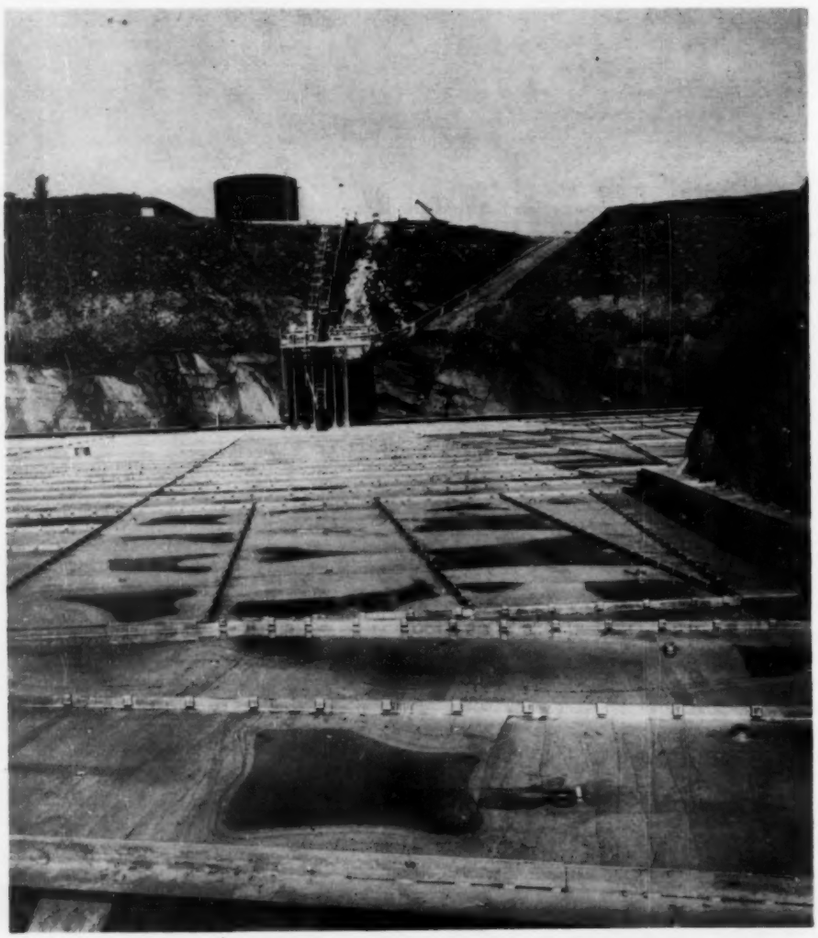
The 750-ton roof for the quarry was designed and built by Hammond Iron Works Co., Warren, Pa., with sufficient buoyancy to support an overburden of five feet of snow. This is far more snow than is known to have fallen at Wind Gap. Should there be a fall approaching the danger point, it is planned to send in a dragline unit to lighten the load.

An accompanying diagram illustrates the principle employed to prevent loss of product through the permeable walls of the quarry. As indicated, the storage unit consists of two quarries, one of which acts as a water reservoir to control the level of oil in the other. Oil is pumped into the quarry at the surface while water is withdrawn at the bottom to accommo-

[1] WORLD PETROLEUM, July 1952.



The slate quarry filled with ground water as it appeared before Esso began preparing it for distillate fuel oil storage.



View of roof, showing metal shelf surrounding mine and neoprene curtain to protect oil from contamination.

date the oil at least 20 feet below the surrounding water table. The water pressure on the outside of the quarry being greater than the pressure of oil in the pit, the oil is sealed effectively against leakage. Any seepage will be in the direction of the quarry with water filtering into and under the oil. When oil is withdrawn, water is pumped from the adjacent quarry to maintain a relatively constant liquid level.

Input capacity of the Wind Gap installation is 6,000 b/d. Maximum withdrawal rate is 8,000 b/d.

The centrifugal pump which takes suction on oil in the reservoir will deliver oil direct to the pipe line. No intermediate pump station is required between platform of the slate mine and the Esso refinery at Linden, N.J. The pumping load is lightened by the higher elevation at Wind Gap than at Linden.

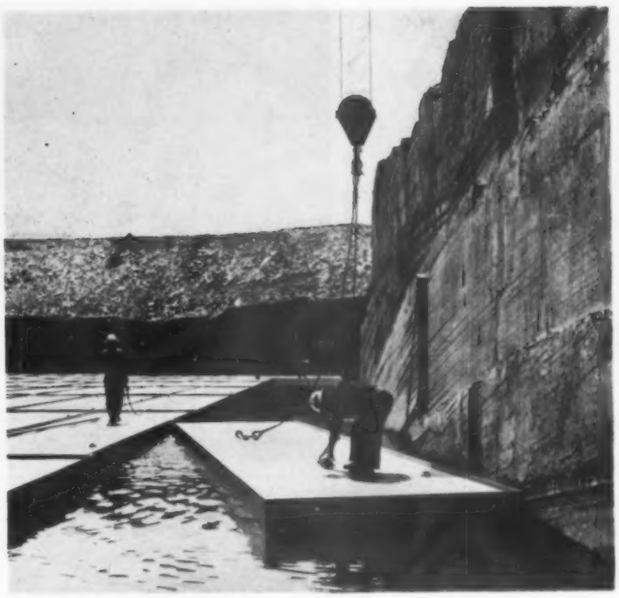
When oil is being withdrawn, it is necessary to pump in water from the water reservoir at about the same rate that product is pumped out. Pump for this purpose is located at the second slate quarry.

Instruments at the oil reservoir measure the oil-water interface and the surface of the oil.

A 5,000-barrel steel slop tank was erected beside the reservoir. It was used originally for cleaning out the pipe line. In the future, it will be used for meter calibration and to settle residual emulsion in case it is necessary to completely evacuate the reservoir.

Esso engineers invited local fire protection personnel to inspect the installation before it was filled with oil. Should the oil become ignited through mischance, the foam system which has been installed

Attaching metal clips to pontoon flanges prior to tack welding.



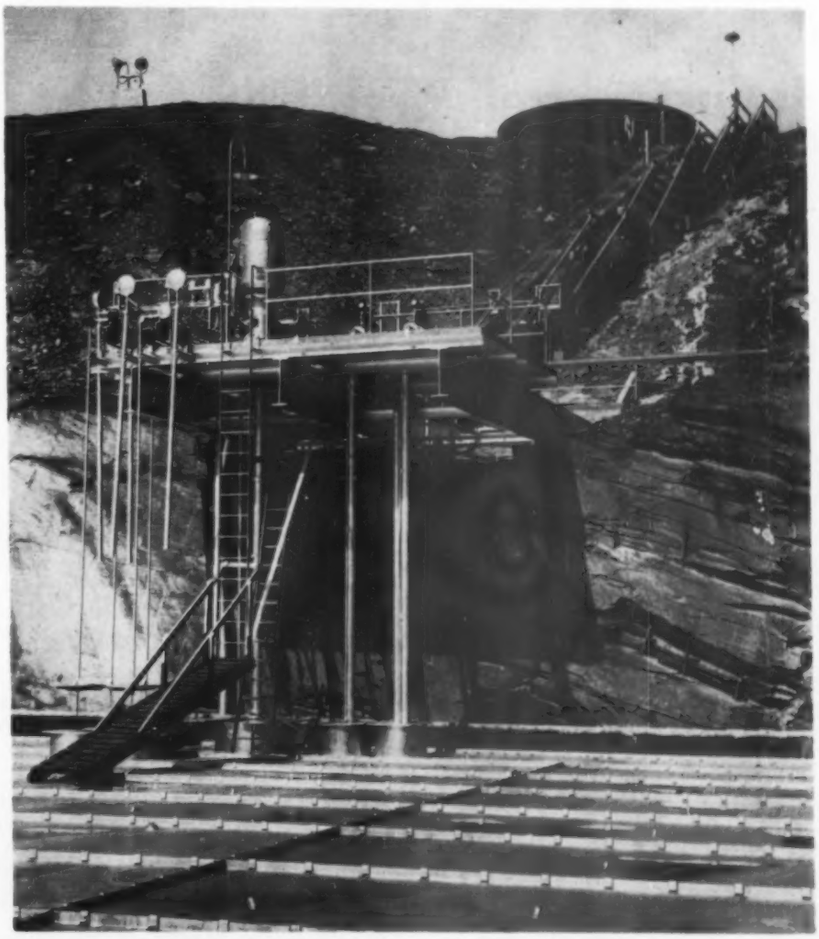
Launching an individual pontoon during construction of the roof.

would snuff out the blaze quickly. Ease of putting out a fire would be much greater than in above-ground steel storage.

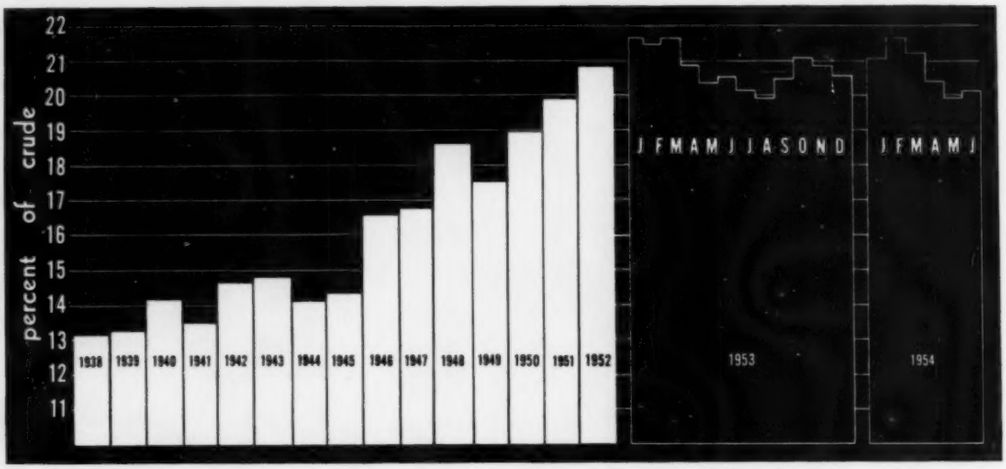
From the standpoint of national defense, the development of successful underground storage is of considerable importance. In time of war, such tanks could be provided with less than 10 percent of the steel needed for above-ground tankage. Crude as well as products could be stock-piled in large quantities and be much less vulnerable to enemy attack by air.

In addition to the open pits similar to those employed by Esso, there are large numbers of caves available. Caverns are found in limestone formations although it may be difficult in some cases to prevent losses of product in solution cavities. Wherever salt beds exist below ground, storage can be washed out quickly and cheaply. Sun Oil Co. is doing this at its new refinery at Sarnia, Ont., and many such tanks have been prepared in the southwest. Mining is feasible for high value products. Standard Oil Co. of Ohio, for example, has been excavating storage in a rock formation below its Lima refinery, and Phillips Petroleum Co. has dug caverns in Illinois adjacent to its product line from Borger, Texas. Worked out mines can be used to store very large quantities of oil although they may often be too remote from supply sources to be feasible.

The Esso experiments will be of interest because of the large number of similar open pits which exist within a reasonable distance from the Eastern seaboard, an area to which very large quantities of oil must be shipped from great distances in peace as well as in war.



Pumping platform. Centrifugal takes suction on the oil when pumping out and delivers direct to the pipe line. Tank in upper right is a slop-tank used in cleaning out the pipe line but will be used for eliminating any residual emulsion if the reservoir is completely pumped out at some future time.



Refinery yields of middle distillates stood at 20.76 percent for the first half of this year, but a cold winter would require an increase in yields of about two percent for a full year.

Industry well prepared for heating season

THIS MIGHT BE IT — the year of the big freeze. For seven years the warming trend in the United States has not been interrupted with an extended cold period such as that which made the petroleum industry hustle in 1947-48 to keep customers well supplied against wintry blasts. In the 1953-54 heating season the weather was about eight percent warmer than normal in the principal domestic fuel oil consuming areas. The previous season was 9.5 percent above normal.

Warm weather has had the effect of neutralizing the steady increase in the number of burners operating in American homes. In the past five years burners have increased 84 percent while deliveries of domestic fuel oils have risen only 26 percent. Weather is not to be blamed entirely for the disparity in rates of growth. New homes are smaller, and even older residences have been insulated to reduce heat losses. Burners are more efficient than before.

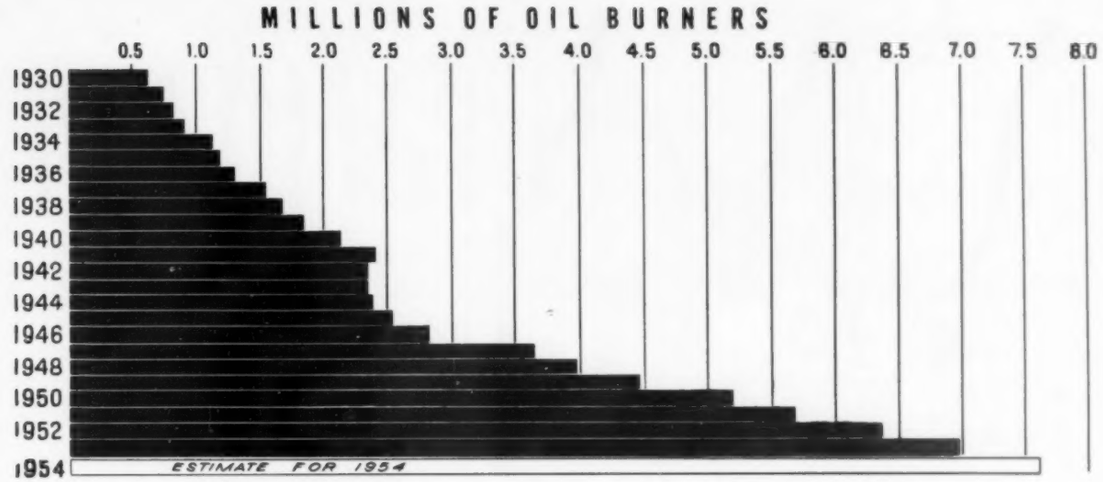
Prior to World War II, the average home equipped with an oil burner consumed 2,100 to 2,200 gallons per year. At the close of the war, this had shrunk to 1,750 gallons. The average in 1951 was 1,638 gallons, in 1952 1,505 gallons, and last year the average was 1,450 gallons. Gallonage decrease per burner since the close of the war is about 17 percent.

A really cold winter could easily reverse the trend. As mentioned above, weather was eight percent above normal last winter. Had the average been eight percent below normal, the average consumption might well have been back to the 1946-47 level, or about 1,750 gallons per burner. The difference in total U. S. demand would have been about 50,000,000 barrels.

The weather would have had little or no effect on diesel fuels which now make up nearly half of the middle distillate demand. An increase of 50 million barrels in demand would have necessitated a considerable change in refinery yields and stocks would have been drawn down to a very low level. At the end of the season early this year, primary stocks of middle distillates were 60 million barrels compared with 135 million barrels at the opening of the season the previous October.

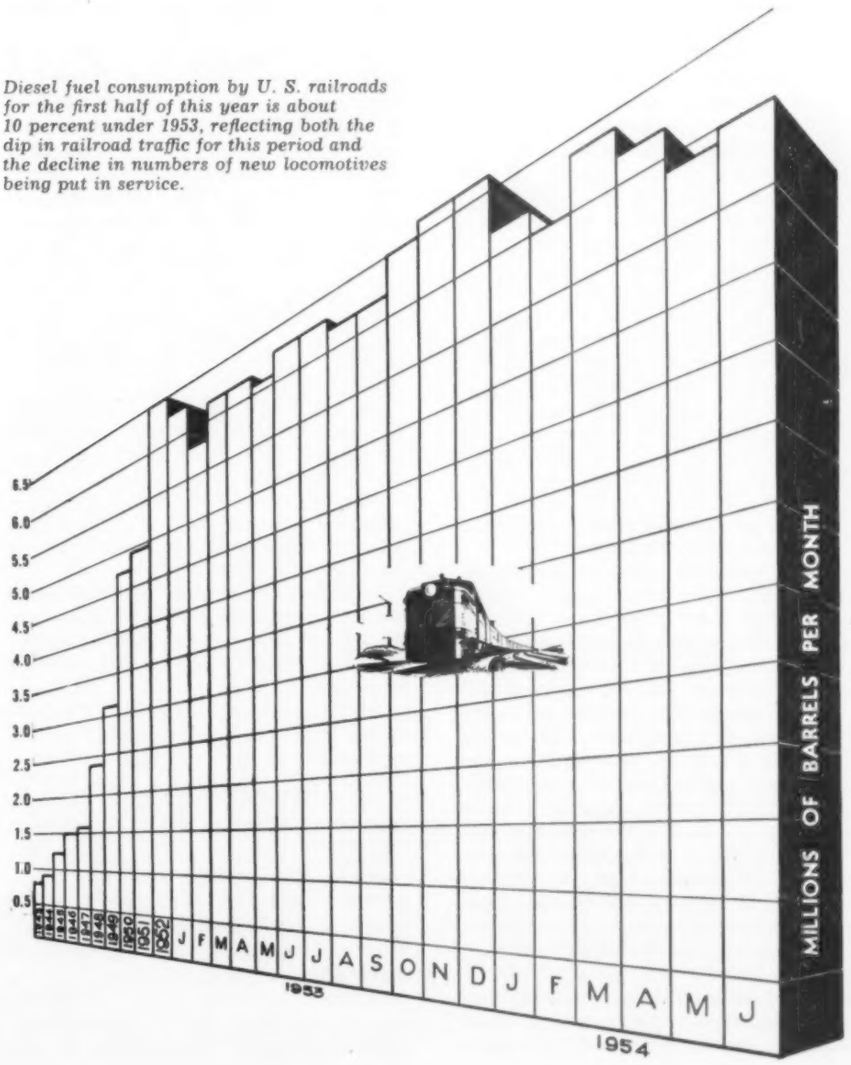
Refinery yields of middle distillates averaged 20.83 percent of crude in 1953 compared with 21.28 percent in 1952 and 20.76 percent in the first half of this year. Peak yield in 1954 was 21.72 percent in February compared with 21.68 percent in January 1953 and 22.59 percent in February 1952. An increase of one percent in middle distillate yields at the present level of refinery operations in the United States would make available about 25 million additional barrels of domestic fuel oils. A cold winter would thus require an increase in yields of about two percent for a full year on the 1953 basis. An even greater impact would be felt during the coming season since another 700,000 home heating installations will be operating by December 31.

From the standpoint of the refiner, such a change in yields would be most unattractive. The average refiner equipped with catalytic cracking facilities calculates that the selling price of middle distillates should be no more than 1.5 to 2.0 cents per gallon below the regular grade motor fuel market if he is to break even after cutting back on cracking. The differential between No. 2 fuel oil and house brand gasoline has been nearly twice the break-even level during the



It is estimated that 7,640,000 oil burners will be in use in the United States by the end of 1954.

Diesel fuel consumption by U. S. railroads for the first half of this year is about 10 percent under 1953, reflecting both the dip in railroad traffic for this period and the decline in numbers of new locomotives being put in service.

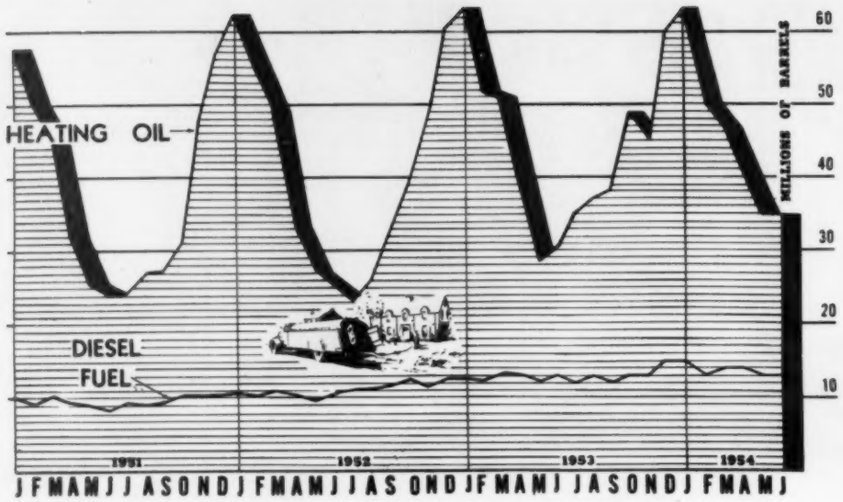


past five years. Accordinging to *Platt's Oilgram*, the average price of No. 2 fuel in barge lots, New York harbor, was 9.68 cents per gallon in 1953 while 86 octane gasoline sold at an average price of 13.12 cents. On the Gulf Coast the cargo market was 8.35 and 11.61 cents. The average midwest markets were 7.85 and 11 cents. Average differential in each market for the past five years as shown in *Platt's Oilgram* is as follows:

	CENTS PER GALLON		
Year	*New York Harbor (Barges)*	*Gulf Coast (Cargoes)*	*Mid-West fob Group 3 (Tank Cars)*
1953	3.43	3.34	3.15
1952	3.39	3.18	2.40
1951	3.55	3.31	2.24
1950	3.81	3.38	2.39
1949	3.42	2.90	2.97

Diesel fuels bring a little better price when compared with gasoline, but not enough. In New York harbor, barges of 50 octane number diesel fuel sold at 2.9 cents per gallon under motor fuel in 1953. On the Gulf Coast the differential was 3.02 cents and in the Midcontinent, 2.42 cents.

It may be assumed that an increase in price of 15 percent would tend to slow down the growth in home furnace instal-


HEATING OIL
DIESEL FUEL
MILLIONS OF BARRELS
60
50
40
30
20
10
1951
1952
1953
1954
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J

Graph shows the wide seasonal fluctuations in refinery shipments of furnace oil compared to the relatively steady diesel fuel demand.

lations and possibly cause some switching of fuels, particularly in areas where natural gas is available. In certain areas, natural gas is an active competitor of fuel oil for home heating. In 1953, 47,065 oil burners were removed from homes in favor of other fuels. On these, 43,218 or 91.8 percent installed gas burners instead of oil. In 1942 losses to other fuels were 33,001, of which natural gas took 82.2 percent, according to data gathered by *Fueloil and Oil Heat* magazine. Oil heating industry observers believe that an increase of 15 percent in fuel oil prices would not materially reduce consumption on an overall basis.

Coal has been losing out to both oil and gas for automatic heating for several years. In 1949 coal stokers constituted 14 percent of all automatic heating installations, oil 50.8 percent and gas 35.2 percent. By the end of 1953, coal stokers represented only 7.1 percent, oil had dropped slightly to 49.7 percent and gas had risen to 43.2 percent.

Burners in operation at the end of 1953 were: oil, 6,992,604; gas, 6,073,300; and coal stokers, 999,540.

The growth in automatic heating for homes has been phenomenal since the close of the war. In the case of oil burners, the rate of increase has been over 10 percent per year. In 1954 it is estimated that 7,640,000 oil burners will be operating on December 31 compared with 4,490,535 on December 31, 1949.

Normally about a third of the annual oil burner installations are made in the first half of a calendar year and the remaining two thirds as winter approaches. On this basis, it is estimated that total sales this year will be about 800,000 and the net increase in installations about 650,000 after allowing for normal replacement of worn-out burners and losses to other fuels.

First half installations totaled 267,333 compared with 252,326 in the first half of 1953. Of these, 16 percent replaced oil burners, 43.4 percent replaced competing fuels and 40.6 percent were put in new homes. On a year-around basis, replacement of worn-out burners is about 12 percent of sales—not the 16 percent seen in first half of this year.

With a 10 percent annual increase in oil burners and a much larger increase in diesel fuel users, the consumption of middle distillates has been rising much more rapidly than gasoline. Domestic demand for gasoline rose 67.5 percent between 1946 and 1953 while middle distillate demand climbed 104 percent.

In anticipation of the coming heating season, refiners and distributors have not built up their reserve stocks this year. Nobody has shown a tendency to worry. On May 31, secondary stocks totaled 12,807,000 barrels. Tanks were about 40 percent full at that time.

A year earlier stocks had totaled 12,756,000 barrels. Normally secondary stocks never exceed 60 percent of capacity or fall below 25 percent.

Refinery stocks of distillate fuels at the close of August totaled 115 million barrels compared with 117 million a year ago.

Dieselization of American railroads is nearing completion. There were only 123 new locomotives on order with manufacturers on August 1 compared with 484 a year ago, 1,429 on August 1, 1952 and 1,588 on the same date in 1951. A breakdown of units being built for the carriers is shown in the following tabulation.

DIESEL LOCOMOTIVES ON ORDER

Type	*Aug. 1 1954*	*Aug. 1 1953*	*Aug. 1 1952*	*Aug. 1 1951*
Passenger ...	4	62	105	114
Freight	96	170	744	635
Pass. or Ft. ..	8	8	68	74
Switch	15	244	512	765
Totals	123	484	1,429	1,588

Within the past 12 months, railroads have added 1,076 diesel locomotives to the fleet, bringing the total to 16,886. In the year ended August 1, 1953, the increase had been 2,032 locomotives. Details of the fleet on August 1, compared with last year, follow:

DIESEL LOCOMOTIVES IN USE

Type	*August 1, 1954* *No. of Locomotives*	*No. Units*	*August 1, 1953* *No. of Locomotives*	*No. Units*
Passenger	1,323	2,340	1,371	2,263
Freight	6,220	11,471	5,358	10,361
Pass. or Ft. ...	884	1,075	799	990
Switch	8,459	8,566	8,282	8,377
Totals	16,886	23,452	15,810	21,991

As fewer new locomotives are added to the fleet in the future, diesel fuel consumption by the carriers will tend to fluctuate with the general economy. Large annual increases enjoyed since the war will not continue. The dip in railroad traffic in the first half of this year, for example, is reflected in a total consumption of 37,243,000 barrels of diesel fuel compared with 36,814,000 barrels in the first half of 1953. The increase was only a little over one percent despite the rise of 10.5 percent in locomotives in service.

Diesel fuel consumption per locomotive in the year ended June 30 was 4,901 barrels compared with 5,070 barrels in the year ended June 30, 1953. In the first half of the current year, consumption was at the rate of 4,500 barrels per locomotive per year, a drop of about 10 percent under the 1953 rate.

Demand for diesel fuel off the rails continues to rise at a satisfactory rate. Deliveries in the first half of the year for automotive and stationary diesel use totaled 43,833,000 barrels compared with 40,473,000 barrels in the first half of 1953. The increase was 8.3 percent.

With a back-log of stock which may approximate 159 million barrels in both primary and secondary storage by November, the oil industry is awaiting the opening of a new season without alarm. If a really cold winter comes and the industry is able to improve its price structure in comparison with gasoline, refiners will look on a continued expansion of middle distillate consumption with greater satisfaction than is the case today.

WASHINGTON relies on committee studies in dealing with national problems

By Joseph B. Huttlinger

COMMITTEE STUDY of problems relating to national security or to government relations with industry has become a settled policy of the Eisenhower administration. It has been carried to an extent that has caused some newspaper men to refer to it as "government by committee." Actually it reflects the President's devotion to facts rather than theory or politics in arriving at decisions on problems of national import and his desire to have information from men in or out of office who may be considered specialists on the subjects considered or who may be interested because of their official positions.

A number of the cabinet or industry committees set up have to do with subjects more or less closely related to the oil and gas industry. The latest of these is the massive, overall study now under way by a committee of petroleum executives, of the ability of the American oil industry to meet the needs of an all-out war.

This study, requested by Secretary of Defense Charles E. Wilson in a September 9 request to the Military Petroleum Advisory Board, carries a "hurry-up" tag from defense officials. They want the answers by November at the latest, in order to use the findings as the basis of legislative or executive action next year, should such be needed in the fields of petroleum and national defense, including aircraft, shipping and the like.

The study, in fact, is the reason for reactivation of the board earlier this year. While details of the survey are secret, it is understood that the military set forth a volume of assumptions as to the amount of aircraft, ships, men, tanks and so forth, that might be used in the event of war; the places where they might be used; the amounts of various types of petroleum products that might be needed; and the areas where they might be needed. In summation, the question raised is, "Can you boys give us the petroleum we need for the war machine?"

In trying for the answers as quickly as possible, the MPAB, under the chairmanship of W. W. Keeler, executive vice president of Phillips Petroleum Co., set up a number of committees and subcommittees covering all phases of the industry. In all, a total of 250 top flight oil executives are at work on the study.

Another study, this one by government, with the help of top executives in oil and gas, may become the basis of the President's recommendation for the coming year in regard to oil imports and other petroleum matters.

This study, in the hands of a special committee of six Cabinet members, aims at setting forth a policy on energy supplies and resources. A staff of executives from coal, oil and gas industries has been called in to aid in the study. A December 1 deadline is facing the committee, indicating the administration's purpose to use the findings in oil-coal recommendations to Congress next year.

The committee, the President explained, "will undertake a study to evaluate all factors pertaining to the continued development of energy supplies and resources and fuels of the United States, with the aim of strengthening the national defense, providing orderly industrial growth, and assuring supplies for our expanding national economy and for any future emergency."

Coal, petroleum and natural gas are specific fuels which the committee is directed to study and report upon. Significant is the fact that the chairman of the Cabinet committee is Arthur S. Fleming, director of the office of Defense Mobilization, who also is chairman of the special inter-departmental committee created by the President only a short time earlier to look into specific problems of the bituminous coal industry. In his dual capacity Mr. Fleming will be in a position to coordinate the activities of both groups.

The Cabinet-level commission, meanwhile, has expressed an intent of hearing the views of a number of representative coal, oil and gas executives who have expressed an interest in giving advice. General Ernest O. Thompson of the Texas Railroad Commission is among these, as are the Independent Petroleum Association of America and the National Jobbers Council. The caliber of the oil men sought by the Cabinet committee is indicated by the fact that the first offer went to J. Ed Warren, vice president of the National City Bank of New York, to head up the oil part of the study. He was unable to accept the post, however,

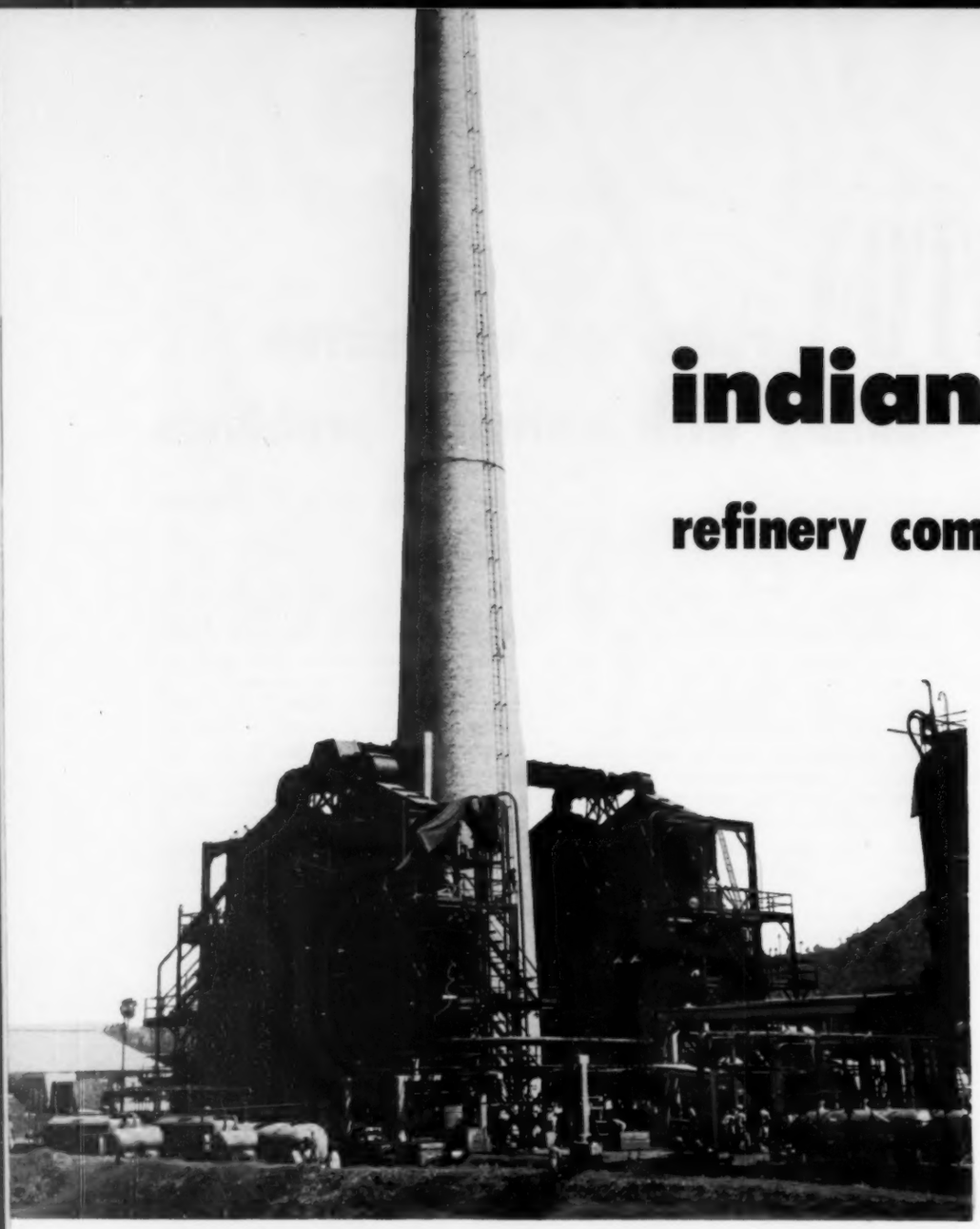
The future policy of the government on continuing research into the recovery of oil from shale may be determined largely by a third study, this one being conducted by the National Petroleum Council at the request of Assistant Secretary of the Interior Felix E. Wormser.

Secretary Wormser advised Chairman Walter S. Hallanan of the National Petroleum Council that it would be "of great assistance" to have the views of the council on the matter. He pointed out that, earlier, an industry group surveying work of the U. S. Bureau of Mines recommended that the bureau halt its oil shale work "unless there is a substantial contribution by industry under a cooperative agreement." Whether the NPC committee will agree is to be seen. Major B. A. Hardey of Shreveport, La., an independent producer, is chairman of the council's shale oil committee.

Beyond these examples, the practice of the Eisenhower administration during the past two years has been one of cooperation with industry. Thus, a group of top flight attorneys were called in to study the antitrust laws and the whole field of legal practice as it affects industry. This study, covering the oil cartel case among others, is due for completion by the end of the year. The national Petroleum Council is continued in existence and is to carry on its surveys of available oil supplies. The Randall commission, set up to advise the President on foreign trade, made its report some months ago. A number of other committees are at work advising the government and the system has recommended itself as providing a factual basis for executive recommendations and permitting business and industry to present its views in a non-controversial atmosphere.

indian

refinery completed six months



Brick stack serves both the furnaces in the combination unit. All photos with this article courtesy the Lummus Co.

STANDARD-VACUUM OIL Co. has activated its $32 million 25,000-barrel refinery at Bombay, India, six months ahead of schedule. The refinery originally had been planned to go on stream during the first quarter of 1955, but favorable labor and supply conditions permitted The Lummus Co. to complete the job early so that operations began in July.

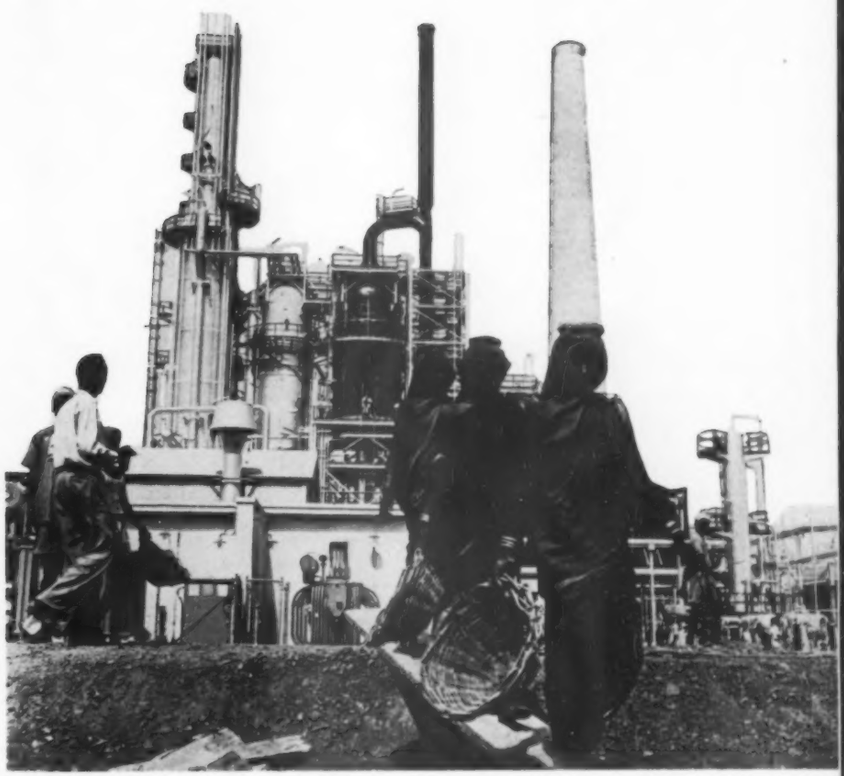
The 280-acre site was made available to the company on December 25, 1952 and ground clearing was begun at the turn of the year. By June 5, 1953 the cleared site was dedicated at ceremonies attended by G. S. Bajpai, governor of Bombay, and George V. Allen, U. S. Ambassador. By that time, Indian sub-contractors had moved 320,000 cubic yards of soil, and warehouses, pipe shops and a concrete mixing plant capable of turning out 600 cubic yards of concrete per day had been erected.

Weather conditions during the succeeding three months were unfavorable. The worst monsoon in history intervened to create special grading and drainage problems. Despite this, the contractor had poured footings and erected most of the larger vessels by October. During peak construction work, nearly 7,000 Indians were employed.

The Bombay installation is the second Stanvac refinery to be completed this year. In January, a 15,600 b/d plant began operations at Durban, South Africa.

A third new refinery, to be completed in Australia next year, will double the company's previous 82,000 b/d capacity in the Eastern Hemisphere where demand for petroleum products has been increasing at a more rapid rate than in the west. The 1955 completion will be a 25,000 b/d fuels refinery and a 2,000 b/d lube plant

ahead of schedule



Working side-by-side with modern derricks, bulldozers, and earth-moving machines, these Indian women carry baskets of earth fill on their heads for a small grading operation near Stanvac's new Bombay refinery.

now being built near Melbourne, Australia. Before the present expansion program was undertaken, Stanvac manufacturing operations were largely centered in Sumatra where the company had a 68,000 b/d plant to process Indonesian crude. This unit is able to refine all locally available raw material. The new plants now being added are designed especially to operate on Middle East crudes.

Stanvac's Bombay refinery is one of the largest industrial plants to be built in India. It represents the largest American investment there since independence. It is the first major oil installation to be built to supply the Indian market, which previously was supplied almost entirely by imported oils.

Two other companies—Shell and Caltex—are building large Indian refineries so that a majority of local demand will be met from Indian sources within the next two years.

Since the close of World War II, the Indian economy has been expanding rapidly and with it the consumption of petroleum products. Oil demand also has been affected by a switch from coal. In 1948 oil supplied 17.3 percent of India's energy requirements and in 1953 the percentage had grown to 21.4. Hydroelectric power was 1.5 percent of the total and coal supplied 77.1 percent of the nation's energy in 1953.

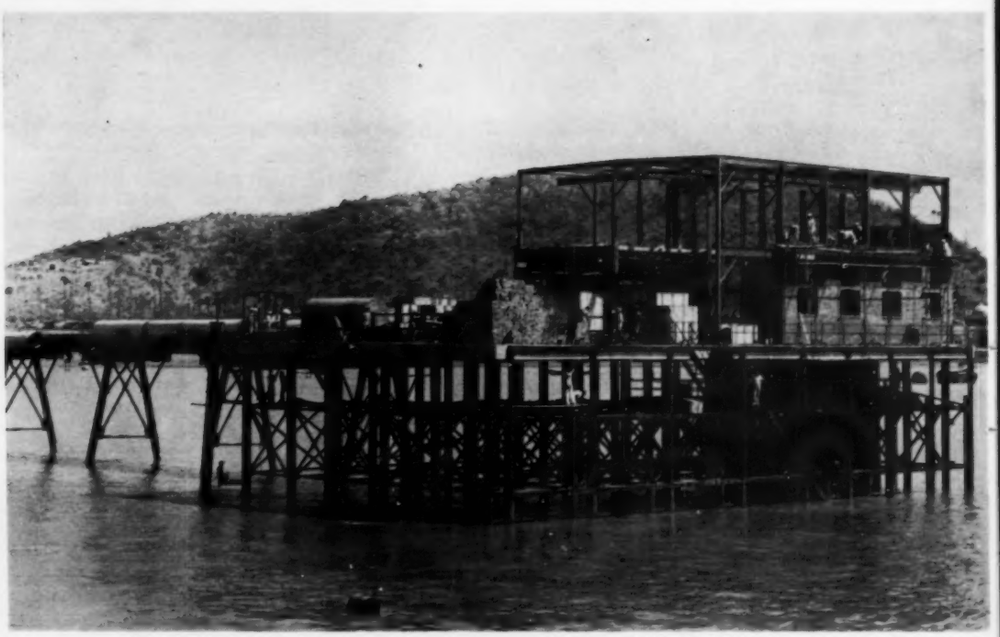
Like many other countries in the Eastern Hemisphere, India is seeking to manufacture a greater share of the goods it consumes. Better highways are being built. Motor transport is expanding and agriculture is being mechanized to some extent. Result of this has been a 37 percent increase in total energy consumption in the short period of five years.

Per capita consumption still is small in India. In 1953 Indian demand was about 31,227,000 barrels for a population of 357,000,000. As the standard of living improves, there is room for exceedingly large further expansion of oil useage.

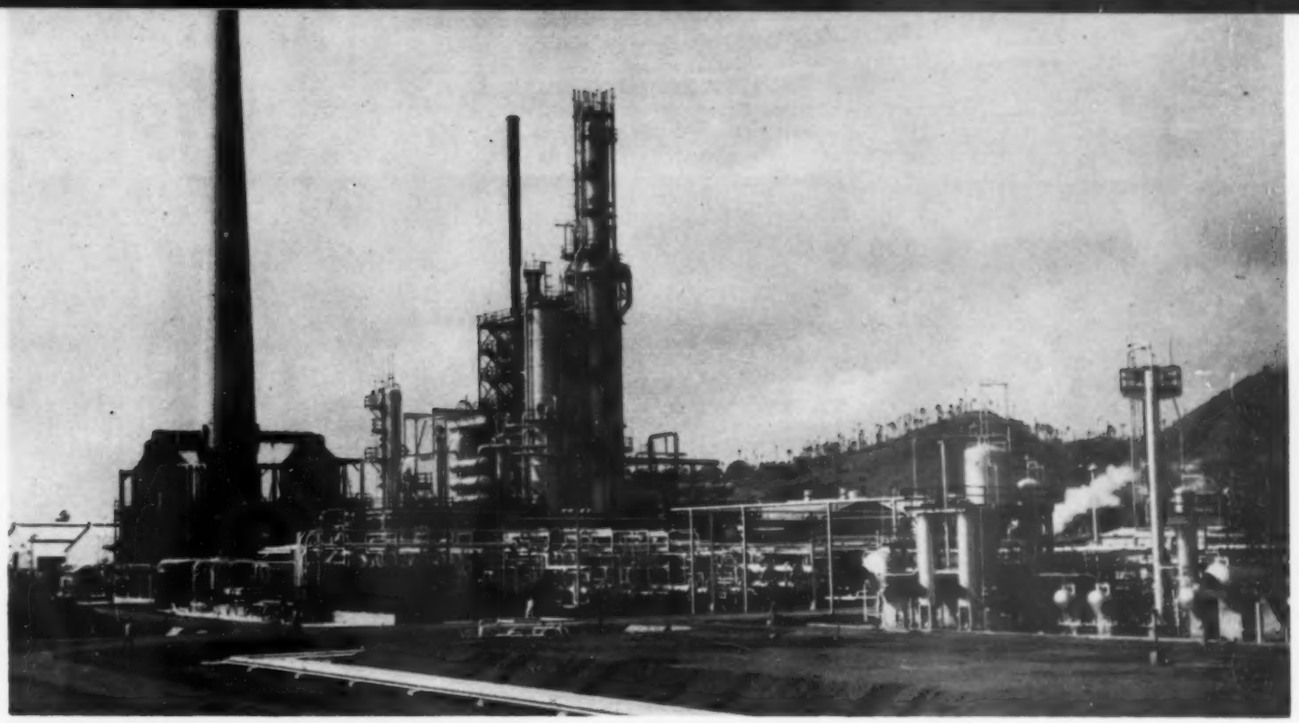
In 1953, India consumed 7,227,000 barrels of motor fuels, 9,335,000 barrels of kerosine, and 11,118,000 barrels of fuel oils. The new Stanvac refinery, with an annual capacity of about eight million barrels of products, will supply nearly a third of current national requirements.

Bombay was chosen as the refinery site because it represented the most concentrated market on the west coast, excellent harbor facilities were available and the area is deemed safe from possible earthquake damage. About 77 percent of India's west coast demand centers about Bombay. Other markets can be reached by coastwise shipping and railroad.

View looking south toward the unitized boiler plant.



Cooling water pump house. Steel erection is complete and brickwork is in progress. A 36" cooling water line at the pump house is being fitted up.



General view of combination unit looking northeast. Sweetening unit is on the right.

Change house and canteen building.

Looking east into boiler plant compressor house, showing Ingersoll-Rand XLE compressors in course of erection.

The refinery site is on Trombay Island in Bombay harbor. Here the earth was found to have good load-bearing qualities. An ample supply of water was available and the plant would be convenient for unloading crude from large tankers.

Design of the plant is similar to the Durban refinery. It consists essentially of a combination crude still, thermal reformer, and Model IV catalytic cracking unit designed by Standard Oil Development Co. The combination design lends itself both to economical construction and operation. Fewer tanks, shorter lines and less steel are required. Off-site facilities are also simplified.

Crude oil in the combination unit design flows first to the crude pipe still where four cuts are taken; light naphtha overhead, heavy naphtha or kerosine distillate, gas oil and bottoms. The light naphtha is stabilized and sent to doctor sweetening. While part of the heavy naphtha goes to finishing operations for the production of power kerosine, the bulk of this cut serves as feed for the thermal reforming furnace.

Reformer furnace products are fractionated, the major product being high-octane thermal-reformed gasoline which is stabilized and then doctor treated. When a kerosine distillate is made, it is processed through an SO_2 extraction plant for the production of illuminating kerosine.

The third cut from the pipe still, gas oil, serves primarily for the production of automotive diesel oils, although some of this stream is used as fluxing stock for fuel oils. Some also may be used as feed for catalytic cracker. The bottoms, containing all the heavy fractions of the crude, are fractionated to obtain catalytic cracking feed. The catalytically-cracked products are fractionated into gasoline, distillate and fuel oil components as well as feed for recycling.

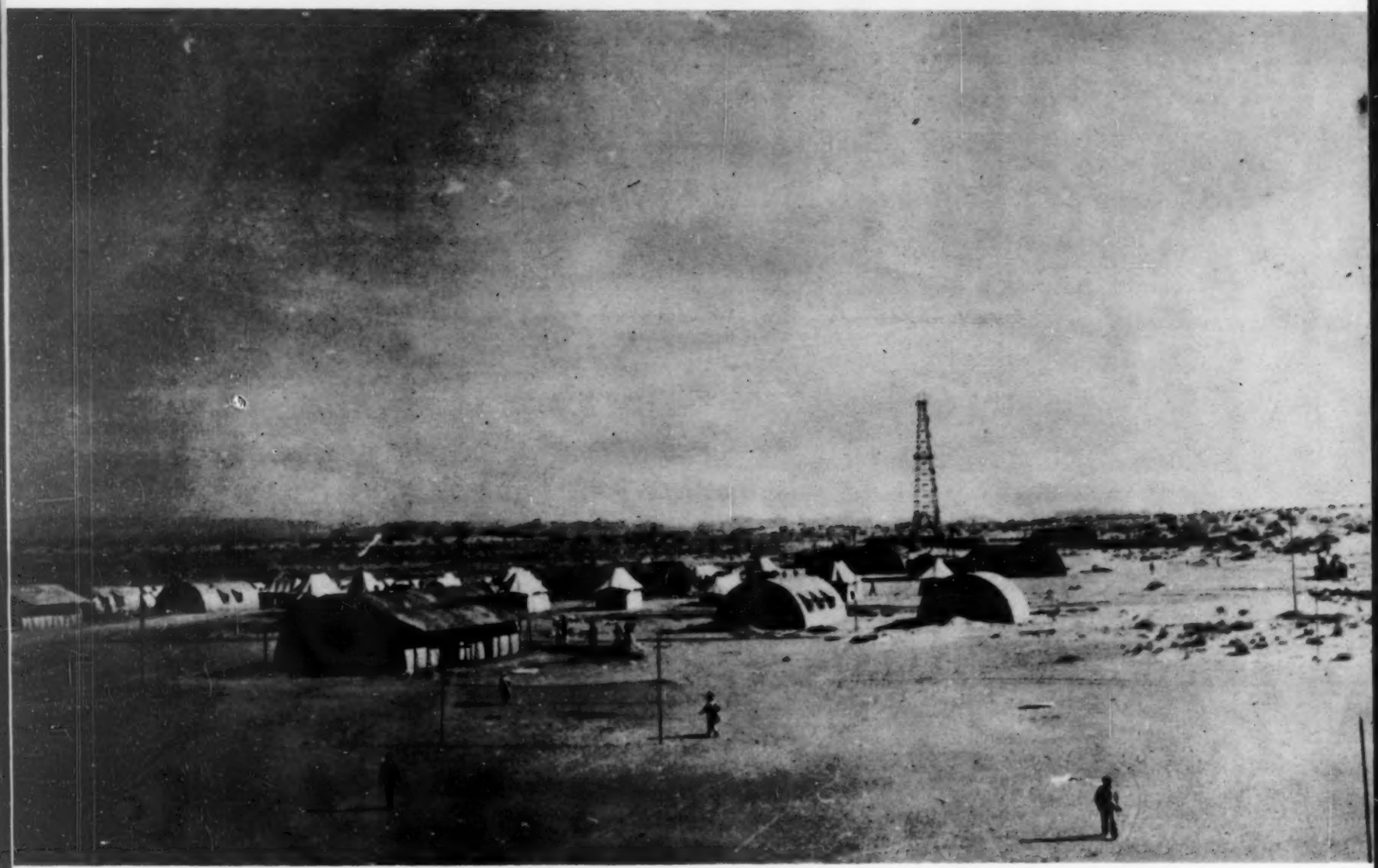
The remaining processes in the refinery are essentially standard. All the gasoline components, after being stabilized, undergo doctor sweetening before the addition of tetraethyl lead, dye and inhibitor.

The SO_2 extraction unit contains complete facilities for treating the illuminating kerosine cut which then is finished by caustic washing, doctor sweetening and filtration.

Power kerosine quality also is controlled by doctor sweetening and filtration. The light cycle gas oil from the catalytic cracker is sent through a caustic wash and is blended into diesel oils and heavy fuel oils.

Private Indian capital has been invited to participate up to 25 percent in the new venture. Debentures and preference shares are open to public subscription.

Indians will be employed to operate the facilities as rapidly as skilled personnel becomes available. Some 500 Indian workers will be employed. In addition to providing employment for Indian workers and capital, the Stanvac refinery will be a source of tax revenue to the State and will reduce demand for foreign exchange.



Camp at Sui gas field, showing No. 1 well in the background.

SUI GAS will serve industrial needs of Pakistan

LATE IN 1950 Pakistan Petroleum Ltd., owned 70 percent by Burmah Oil Co. and 30 percent by the government and public of Pakistan, adopted plans for exploration in search for petroleum in Baluchistan. The area selected for testing was the arid Sui district of the Bugti tribal section of the state.

Preparation for the undertaking involved the establishment of a railroad base at Kashmor, on the narrow gauge railway from Jacobabad, and the laying out of an airstrip near by. A road 35 miles long, mainly over soft sand, was constructed to the location selected for the first test well and a 40-mile pipe line was laid to carry water from the River Indus to the site.

Drilling started on October 10, 1951, and the first well was drilled to its final depth of 10,049 feet in July 1952. No oil was found in this well, but an accumulation of natural gas at high pressure was encountered. To determine the extent of this gas accumulation, further development wells were drilled, the first three confirming the presence of a large gas field. A fourth well is now being put down in the same area, the location of of which is about 69.2° longitude E and 28.65° latitude N.

A test well drilled in the Zin area, also in the Sui district, proved disappointing and is likely to be abandoned, but preparations are under way for another test at Uch to the west of Sui and Zin.

The result of the drilling at Sui having shown by the end of 1952 that a very large gas field had been found, discussions took place between the Pakistan government and Pakistan Petroleum Ltd. regarding possible uses for the gas. These

Map shows route of projected Sui gas line from the field to Karachi.

conferences led to the decision to undertake a project for the distribution and utilization of Sui gas for industrial and domestic purposes in and around Karachi by the Pakistan Industrial and Development Corp.

In March 1953, C. Stribling Snodgrass, technical adviser to Pakistan Petroleum Co. Ltd., arrived in Pakistan to prepare a report on the feasibility of moving gas from Sui to other parts of the country with special reference to transporting it to Karachi, via Sukkur, Rohri and Hyderabad for consumption, thus reducing the requirements of coal, all of which had to be imported. His report was submitted to and studied by Pakistan Industrial Development Corp. and the World Bank, and in August 1953, Mr. Snodgrass returned to Karachi to work out details for bringing the gas by pipe line to Karachi, and a detailed survey of the pipe line route was made.

The line is to be of 16-inch o.d. and will be approximately 350 miles long. Its design is such that the gas will be self-propelling from Sui to Karachi when transmitting a volume up to 70 million cubic feet per day. As and when requirements exceed this quantity, compression plants will be installed at Mile 79 and Mile 167, enabling the line to transport its design capacity of 110 million cubic feet per day.

The estimated cost of the initial installation of the pipe line, together with all plant and machinery required for the laying project and that required for delivery of the 70-million cubic feet per day, is £9,000,000 ($25,200,000), of which £5,000,000 ($14,000,000) is to be provided by a loan from the World Bank to the Sui Gas Transmission Co., a company recently formed to undertake the project, and the remaining £4,000,000 ($11,200,000) by equity capital from the Commonwealth Development Finance Corp., the Pakistan Industrial Development Corp., the Burmah Oil Co. and the Pakistan public, in roughly equal proportions.

Contract for the project has been awarded to D. & C. & Wm. Press Ltd., London, and Morrison-Knudsen of Pakistan, who put in a joint tender and formed a partnership, "Pakistan Constructors," to carry out the project.

Pakistan Constructors has set up headquarters in Karachi with Charles Buck as project manager and Alastair Eadie as assistant project manager and chief engineer. Instructions to go ahead were given in mid-May of this year and the line is scheduled for completion in the first

Rig drilling No. 1 well at Sui.

week of May 1955 under a penalty and bonus clause. The problems connected with the project are many and varied, and call for exceedingly careful planning and programming, particularly in view of the time limit imposed by the contract.

The line will traverse about 200 miles of dry, partly desert terrain and about 150 miles of wet, irrigated land. Rock is expected to be met with over about 25 percent of the length and there are some 69 river and irrigation canal crossings, of which some 25 will require Bailey bridging for construction work.

In the irrigated areas the growing season extends over the monsoon period from May to October, and so only preparatory work can be carried on in these areas during that period, the actual pipe laying having to be done in the dry period between October and May when the land is free of crops. In some parts of these areas ditches for the pipe track will have to be continuously freed from water even during the dry season.

Temperatures will be onerous for outdoor work, day temperatures ranging from 75°F to 108°F. Thus it is essential that good living conditions for all classes of staff should be carefully maintained to preserve health and efficiency.

Mobile camps will keep pace with the progress of the line so that there will be no unnecessary loss of time in transporting workers from the job to their living quarters and vice versa.

At this latitude, however, during the laying time there will be daylight for about 11-12 hours which enables a long day to be worked.

About 45,000 tons of 16-inch pipe is being shipped from England to Karachi for the work. Shipment of this pipe commenced in August and the whole of it will have to be shipped and unloaded at Karachi before the end of the year to keep ahead of stringing. The unloading at Karachi will be a tax on that port's space and facilities.

The pipe has then to be moved up country by rail to sidings convenient for stringing, and rail wagons of a sufficient size to handle these long lengths are somewhat scarce.

In addition to the pipe, some 5,000 tons of construction and auxiliary plant to the value of over £1,000,000 ($2,800,000) shipped partly from the United States and partly from England will have to be unloaded at Karachi and transported to destination.

The line will be of 16-inch diameter throughout its length and the pipe is to be of API specification 5-LX high test line pipe, the wall thickness being in three sizes (0.438 inch, 0.312 inch and 0.250 inch) according to location. The contract for this pipe has been placed with Stewarts & Lloyds.

The whole line will be buried with a 3-foot 6-inch cover, except at valve emplacements and river and canal crossings and over barrages. It will be coal-tar enamel coated, spiral glass mat wrapped and cathodically protected. Two types of outer wrap will be used:

(1) Where rock or stone is encountered, mainly in desert stretches, tar impregnated glass staple tissue "Thermoglass coal tar" will be used and a 6-inch soft bed laid underneath.

(2) Where there is no rock or stone, mainly in irrigated areas, Perrault kraft paper will be used.

At river and canal crossings, the pipe may be laid below the canal bottom and kept in place by concrete weights, but in many cases it will be carried above water level on pile supports 50 feet apart. Each support consists of two 8-inch x 8-inch broad flange beams driven into the canal bottom, with cap plates and pipe guides welded on. A walkway and sunshade rest on the pipe.

At such crossings the pipes are covered with double lapped Lassoproof PVC tape, painted with aluminum paint to reflect heat.

For road or railway embankment crossings a hole is bored through sufficiently large to take a 20-inch casing, which is previously primed and is given one hot flood coating of coal tar enamel. The 16-inch line is then threaded through, already wrapped, and the spaces at the ends between casing and pipe are closed by Williamson seals.

The main line is sectionalized by 20 12-inch Venturi-type plug valves with 4-inch by-pass and blow-down valves, so that in case of leaks or breakages due to any cause, the section in which that occurs can be isolated and gas freed for repairs.

Where the line crosses the two barrages on the Indus, at Sukkur and Kohri, automatic shut off valves are located at each side of the barrage. These comprise a 12-inch and 6-inch taper plug cock together with control cabinet and pressure reservoir. In case of a break in the line crossing the barrage, the 12-inch line valve shuts immediately and the 6-inch valve opens and vents the gas in the barrage section of the pipe to atmosphere. These valves can also be operated, in case of emergency, by push button controls from either side of the barrage.

The route selected for the pipe line is intersected by some 60 canals and rivers, the width of these varying between six feet and 250 feet and these will have to be crossed both in transporting material to the site and during the actual laying. The smaller canals, which are mainly used for irrigation, will be dry for the most part during the laying period, and thus present little difficulty. The longer spans, of which there are 25, will have to be bridged, and for this purpose Bailey bridging will be used. In the case of very long spans, rafts of R. E. pontoons and Bailey bridging will be necessary for the passage of equipment and pipe.

The rafts will also serve to support the equipment and for driving the broad flange beams which form part of the pipe supports.

Completion date for the contract is May 1, 1955. Due to harvest conditions in the irrigated areas, the actual laying of the pipe cannot be commenced until October 1, 1954, giving 28 days per month or a total of 196 days, and it will be seen that a rate of approximately two miles per day will have to be achieved.

This calls for two spreads of operation, each spread having full construction plant equipment of all kinds, together with living accommodation for all classes of operators engaged on the job.

This work is planned as follows:

Spread No. 1: This spread will commence laying operations at Mile 135, working north to Sui. The first 55 miles is over terrain which is mainly dry; the next 60 miles is over irrigated land which will have had time to dry out to a certain extent before laying operations commence, although in some parts it remains so wet that the ditches will have to be kept clear of water by constantly pumping to canals. The final 20 miles is over dry terrain. Work on this section is scheduled for completion by February 23, 1955, after which the whole plant and personnel will be moved to Karachi, an operation scheduled to take about seven days. The spread will then work backward to Mile 305, where it is scheduled to meet spread No. 2 on May 1, 1955.

The pipe wall thickness from Sui to Mile 135 will be 0.312 inch, except that portion crossing the Sukkur barrage, about Mile 79, where the thickness will be increased to 0.438 inch. On the latter section, from Karachi back to Mile 305, the pipewall thickness will be 0.250 inch.

Spread No. 2: This spread, like spread No. 1, will commence at Mile 135, and work south to Mile 305. The first 31 miles

is over partly desert terrain, the next portion of 85 miles being over irrigated terrain, which is mainly paddy fields. Programming this way gives a further drying-out time for this land, which is heavily irrigated during the growing period. The latter portion of 54 miles to Mile 305 is over dry terrain. Work on this spread is scheduled for completion at Mile 305 on May 1, 1955.

The pipewall thickness of the first 31 miles of this spread is 0.250 inch and is then increased to 0.312 inch for the next 60 miles, after which it is again reduced to 0.250 inch for the rest of the distance, except at the Kotri Barrage, about 0.65 miles, where the thickness is 0.438 inch.

It will be noted that the changes in pipewall thickness are correlated with later work when compression plants are scheduled for installation at Miles 79 and 167, in order to bring the line up to its designed capacity of 110 million cf/d.

At the compressor stations, in addition to the compression plants, pressure recording instruments, based on orifice measurements, and temperature recording instruments will be installed.

Line joints will be electrically welded throughout, 14 welding sets being available for each spread. Each weld, before the line is primed and wrapped ready for ditching, will be tested for leaks at 100 psi by priming coat, or alternatively the welds will be tested by X-rays.

After ditching and before back-filling, the sections of the completed line will be tested by air under pressure. Pressures used will be 1,285 psi for the 0.312 inch thick sections and 1,020 psi for the 0.250 inch thick sections.

Holiday detection, after the wrapping and laying of the line, will be carried out by a new portable battery-operated type of detector designed by Cathodic Corrosion Controls, Ltd. The set complete measures 8½ x 8½ x 16 inches, weighs 27 pounds and is easily carried along the pipe line by a leather sling over the operator's shoulder.

The necessary voltage for testing can be up to the order of 20 kv and is generated by means of an induction coil with a sealed-in vibrator unit in the primary circuit. This vibrator has two sets of contacts which can be selected by means of a switch, so that there is always a reserve set available. The complete vibrator unit is of the plug-in type and easily replaceable. The instrument has an adjustable shielded spark-gap which acts as a test voltage limiting device and also is an indication of breakdown, there being a constant stream of sparks where the coating is sound and a cessation of these when spark-gap is short circuited by a holiday.

The electrodes used for pipe work are of the rolling spring type with a quick release connector and are travelled along the pipe by means of a metal shoe on the end of an insulating rod; the latter is held by the operator and the flexible high tension lead is taken down through it to the shoe. The circuit is completed via the soil by a trailing lead from the unit.

Each battery is good for a day's operation, the spare being charged in the meantime.

As a further precaution and to ensure the highest class of welding, the welders, before being sent out to the job, are all put through a special course of training at the works of the Lincoln Electric Co. Ltd., which has supplied all the welding equipment and electrodes.

A fully equipped mobile camp attached to each spread can follow or precede the construction gangs.

These camps are each mounted on 26 tractor-towed trailers and consist of 20 sleeping cabins, built of aluminum, which are glass wool insulated and air conditioned, so that their occupants will be insured proper rest and sleep, which are of major importance in view of the ambiant climatic conditions. The ancillary equipment will include kitchens, offices, ice making plants, refrigerated stores, cabins, dry store cabins, mess cabins, shower and toilet cabins and dispensary cabins, as well as a workshop for repairs.

Each camp is equipped with its own electric supply and all the units where the use of water is necessary are permanently fitted for its use with pumped supply, so that immediately a camp reaches its destination, pumps can be connected to any suitable water source, after which the supply in the cabins is available without any long waiting interval. Food and other supplies will be brought from base by refrigerated trucks.

Further sleeping accommodation is provided by 100 double roof tents to each spread, the occupants of which share in the other amenities of the camp.

There is to be a ring gathering main at Sui gas field for the collection of gas from the various wells. It will consist of about 14 miles of 16-inch o.d. 0.438 inch thick pipe of the same specification steel as the transmission line.

A work party in the arid Sui district.

Joined to this ring main will be the lines from the individual wells, either 6-inch or 4-inch, both of 0.23 inch wall thickness. These lines will be electrically welded and laid on above-ground supports, double wrapped with PVC tape, with additional layers at supports. The final finishing will be two coats of aluminum paint. All valves in the gathering system are to be "in line" installations at the same level as the pipe, there being no water problems in this area. This gathering system is to be air tested at 1,285 psi.

The gas purification plant is located between this gathering system and the transmission line. This plant is being supplied by the Hudson Engineering Corp. Composition of the gas is about 91 percent methane, with a specific gravity against air of 0.65 and a thermal value of 960 Btu per cubic foot.

In addition to the main transmission line, distribution branches have to be laid to the main consuming towns: Rohri, Khairpur, Hyderabad and Kotri, which lie close to the proposed route. These branches require some 36 miles of 6-inch, 8-inch, 10-inch and 16-inch pipe.

At the Karachi terminus, a distribution system for that area must be installed in time for the gas to be available for industrial and domestic consumption by August 1, 1955.

All plant of American manufacture, amounting in cost to about £500,000 ($1,400,000) has arrived on site and a large percentage of that purchased in the United Kingdom has been despatched and will arrive in time for welding to commence on the appointed date.

The first batch of pipe, over 3,600 tons, arrived in Karachi early in August and at time of writing was cleared and on its way to destination.

Group picture of Desk & Derrick conventioneers assembled on the terrace overlooking the Bow River and scenic surroundings at the Banff Springs Hotel, Banff Springs, Alberta, Canada.

Desk and Derrick Convention Highlights

By M. Stephens Miranda

MRS. SYBIL SURECK, a beautiful and intelligent woman from Oklahoma City, geographical center of America and the "heart" of the great American petroleum industry, is to be the new 1954-55 president of the Association of Desk and Derrick clubs of North America.

The election took place at the third annual convention of the association, where nearly 600 women representing 78 Desk and Derrick clubs were convened September 7-8 at the scenic Banff Springs Hotel in Alberta, Canada in the fifth year of the club's existence.

Desk and Derrick delegates also voted to establish a central distribution headquarters office of the association at Tulsa, Oklahoma. This is a significant move toward the ultimate goal of this group of oil women who first convened as a single club, formed in New Orleans in 1949 by Inez Awty Shaeffer, whose idea that the common interests of women in the petroleum industry would be served by associating together to provide avenues of learning about the oil industry. It was thought that closer association would have social value, and oil women would gain much in improved performance on the job and increased consciousness of personal accomplishment. The initial club received due notice in the petroleum and business press, and aroused such great interest that with consent for the use of the name "Desk and Derrick," Jackson, Mississippi organized a club in June 1949, followed by Los Angeles, California in April 1950, and Houston, Texas in August 1950. These four clubs then pooled their interests, while retaining the autonomy of each respective club, providing only for uniform policy and in protection of mutual interest, and in July 1951

(Continued on page 66)

Left to right: Irene Cox, 1953-54 president; Margaret Neff, immediate past president (1953); and Sybil Sureck, newly elected president of the Association of Desk & Derrick Clubs of North America.

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The Davison Chemical Corporation has teamed with The Atlantic Refining Company in the development of a catalyst for reforming straight run and cracked gasolines to a product of higher octane level. Among the important tasks delegated to Davison was the translation of this catalyst from laboratory to commercial production and at the same time impart optimum selectivity, stability, ruggedness and regenerability.

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GERMANY Finds New Oil Fields

Workers on rotary table of a derrick in Holstein.

By Alfred M. Stahmer

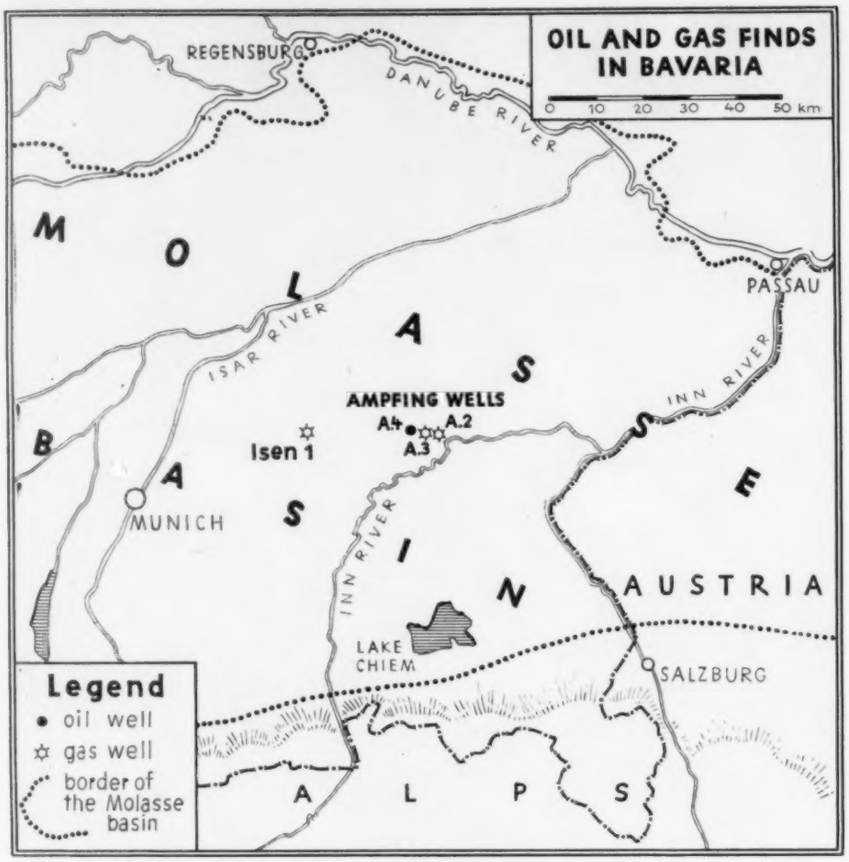
FROM LAKE GENEVA in the west to the Moravian town of Bruenn in the east, there extends a zone of marine deposits in the foreland of the Alps, the so-called Molasse Basin. Even before World War II, geologists began to give their attention to the possibilities of finding oil in this area. In the early 1930's exploration work by Austrian and foreign geologists in the Vienna basin, the easternmost part of the Molasse Basin, met with success. Zistersdorf, Gaiselberg, St. Ulrich, Muehlberg, Aderklaa and Matzen are the names of oil fields discovered near Vienna which have enabled Austria to reach an annual output of more than three million tons of crude and to take second place among the oil producing countries of Europe outside the Soviet Union.

In Switzerland and in the German part of the Molasse Basin, several wildcats were drilled before World War II, but only negligible oil showings were found.

In Bavaria the Bayerische Mineral-Industrie AG., an affiliate of Socony-Vacuum, acquired concessions and after preparatory geological investigations sank deep wells in the area between the Danube and the Inn. After the war the search for oil was resumed, this time with the aid of modern reflection seismic methods. North of Lake Constance, in the Swabian part of the Alpine foreland, heavy oil traces were found in wells of Deutsche Schachtbau- und Tiefbohrges GmbH. and Wintershall AG. It was realized that as a rule the structural characteristics in the Molasse Basin were less accentuated and therefore more difficult to define than in most of the other prospective oil areas in central Europe. Nevertheless, more deep wells were sunk, and early in 1954 the first find of economic importance was made in the well Ampfing 2 of Deutsche Vacuum Oel AG. (Bayerische Mineral-Industrie), on what appears to be a local elevation on a fault zone extending from west to east. Ampfing is situated about 50 miles east of Munich. Natural gas and certain quantities of condensate were discovered in the wildcats Ampfing 2 and 3 in the basic sands of the Tertiary at depths of 5,710 and 5,775 feet respectively. Production tests on both wells yielded about four million cubic feet of natural gas per day through 1/3 inch chokes. A pressure of 1,920 psi was measured. The gas has a methane content of 94-95 percent.

In the middle of May 1954 also the wildcat Isen 1 of Deutsche Vacuum Oel AG. (Bayerische Mineral-Industrie), situated 16 miles west of Ampfing, met gas in a sand layer of the Oligocene (Tertiary). Production tests yielded results similar to those at Ampfing. However, the gas obtained did not contain any condensate.

When the first find was made in Ampfing 2, early in 1954, the opinion was expressed that the gas cap of an oil deposit situated still deeper had been struck. Apparently this belief has now been proved correct. In late July the exploration well Ampfing 4, sunk by Deutsche Vacuum Oel AG. (BMI) jointly with Gewerkschaft Elwerath and Preussag 1.4 miles west of Ampfing 3, met oil in the basic sands of the Tertiary at a depth of 5,866 feet. This is the first oil deposit worthy of economic exploitation to be discovered in the German part of the foreland of the Alps. Hitherto the only known oil field in Bavaria was a tiny one, Tegernsee, south of the Tertiary basin, which yields the negligible quantity of about a ton of crude per



GERMAN CRUDE OIL PRODUCTION IN TONS

	First half of 1954	July 1954*
Emsland	495,655	88,738
Weser-Ems	139,653	28,535
Hanover	474,441	82,678
Holstein-Hamburg	119,456	21,531
Upper Rhine Valley	28,453	6,762
Total German Production	1,257,658	228,244

*Preliminary figures.

month from the Flysch and more or less constitutes a curiosity.

During preliminary production tests the well Ampfing 4 flowed 60 tons of crude per day through a ¼ inch choke or 10-15 tons through a ⅛ inch choke. It is a remarkable feature of this find that the oil-bearing horizon was met at a depth only 92 feet below that of the gas well Ampfing 3 situated at a distance of 1.4 miles in higher structural position.

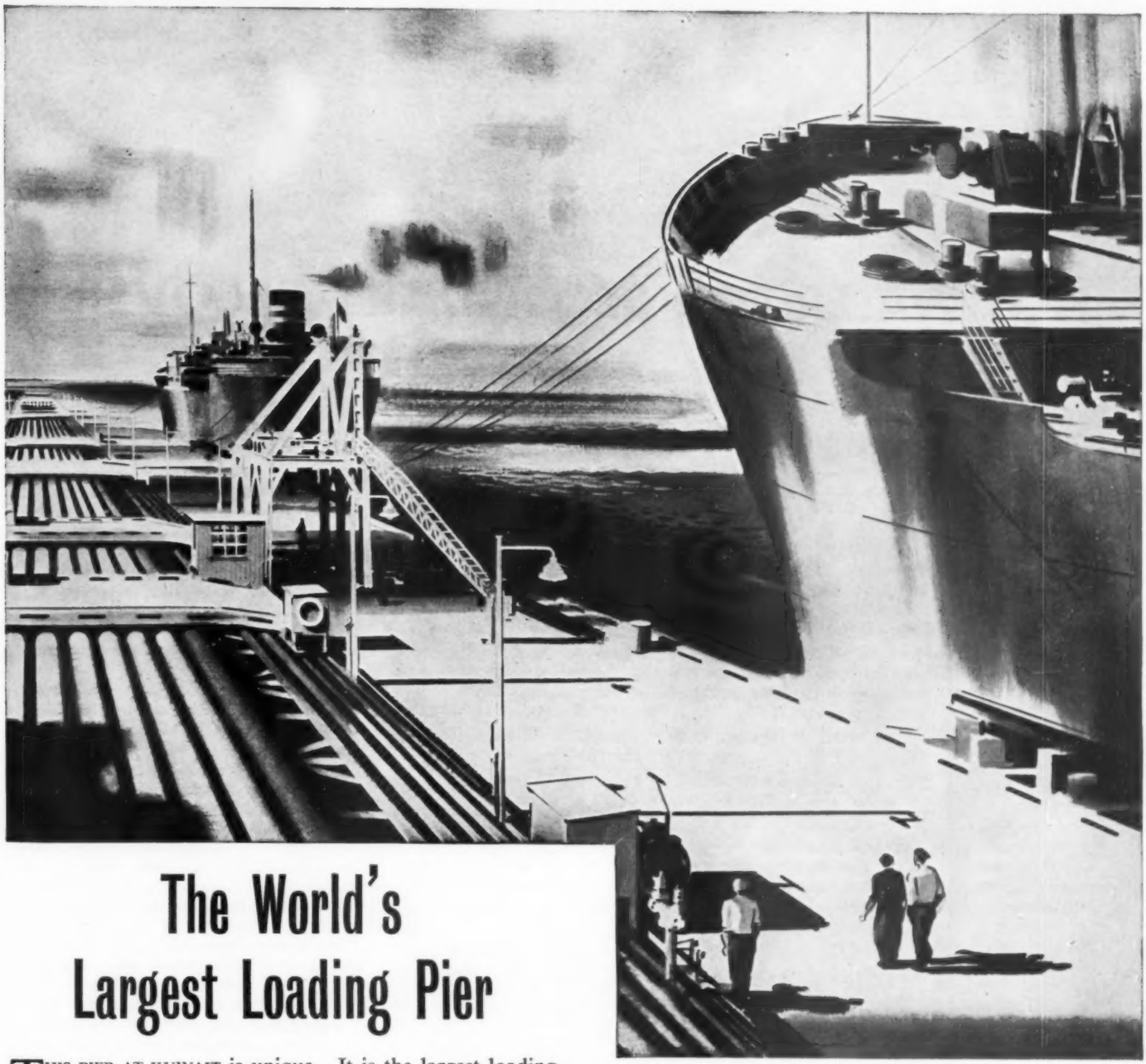
Not only in the south of the Federal Republic, but also in the northernmost province, Schleswig-Holstein, a remarkable oil find was made this summer. As early as 1952 the oil fields Boostedt and Ploen-Wankendorf had been discovered on the northwestern edge of the Jurassic basin, north of Hamburg, which extends nearly as far as the town of Kiel on the Baltic. During the first six months of 1954 these two fields together yielded 53,000 tons of crude. Since the spring of 1953, a joint interest group consisting of Deutsche Erdoel-AG., Preussag and Deutsche Vacuum Oel AG. has been engaged in exploration work along the western edge of the Jurassic basin between the towns of Elmshorn and Bramstedt in southern Holstein. In June last these activities met with success. At a depth of 6,500 feet the wildcat Bramstedt 3a met the sandstone of the Dogger. During production tests the well flowed about 300 barrels per day through a ⅛ inch choke. The crude has a high gasoline content, its specific gravity varying between 0.851 and 0.855. The significance of the Bramstedt find lies mainly in the fact that this deposit, like the prolific oil field Hankensbuettel near Gifhorn (Hanover) which was opened early in 1954, is a stratigraphic trap situated rather flatly below the covering transgression of the Lower Cretaceous and therefore promising to be of larger extent than the Boostedt and Ploen deposits.

In the first half of 1954 German exploration activities achieved outstanding results by discovering the oil fields Hankensbuettel, Bramstedt and Ampfing. In addition to these, several other finds have been made which may not be of the same economic importance, but which nevertheless will enhance German crude production. Gewerkschaft Elwerath has opened up oil-bearing Pechelbronn beds at Wattenheim near Worms (Upper Rhine) and have struck oil in their wildcats, Ruehme 11 and Vechelde 2a, both near Brunswick.

The successful wildcat, Oerrel-Sued 2 of Deutsche Erdoel-AG., is of importance in that it has opened a deposit which possibly constitutes an extension of the Hankensbuettel field.

Two gas finds have been made: one near the old oil field Oberg, the other at Meerdorf near Brunswick. From the oil district between the rivers Weser and Ems, Wintershall AG. has reported that the exploration well Bockstedt 2, two miles north of the Aldorf field, met the oil impregnated Valendis (Lower Cretaceous) at a depth of 3,870 feet on a saddle anticline not connected with the Aldorf structure. Lastly, the wildcat Cismar 1 of Gewerkschaft Brigitta (Shell and Jersey Standard) situated near the shore of the Baltic, should be mentioned. In April last it met encouraging gas traces in the Zechstein at a depth of 10,350 feet. Brigitta intends to sink another deep well to obtain more precise information on the geological structure of Cismar.

In July 1954 the daily yield from the west German oil fields rose to 228,000 tons compared to 191,926 tons in July 1953. The crude output in West Germany may be expected to reach a total of approximately 2.6 million tons, about 50,000 barrels per day, in 1954.



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Now the pier has grown once more. Submarine lines have been laid to three new buoy berths, making it possible for up to thirteen tankers to load simultaneously. During a recent month 253 oil cargoes were loaded—a record figure ; and the average stay for each tanker is now only 18 hours.

Behind this latest extension lies a story of rapidly increasing crude oil production. Last year Anglo-Iranian's offtake from the Kuwait fields amounted to 466,320 barrels per day compared with 396,400 barrels per day in 1952. Thirteen producing wells were completed during the year at Magwa, a northerly extension of the Burgan field.

Throughput at Anglo-Iranian's twelve refineries in 1953 was 400,000 barrels per day. With the commissioning of Aden and Kwinana Refineries and the expansion at others, total capacity by the end of 1955 should be some 600,000 barrels per day.

THE BP SHIELD IS THE SYMBOL OF THE WORLD-WIDE ORGANISATION OF

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LIMITED

HOT WATER FOR SECONDARY RECOVERY

By E. B. Chekalyuk, K. A. Oganov, E. A. Stepanchkov and A. N. Snarksy*

Within the past few years there has been a resurgence of interest among petroleum engineers in the application of heat to petroleum reservoirs as an aid to secondary recovery. Work by production research workers of Magnolia Petroleum Co. and Sinclair Research Laboratories, Inc., has been widely followed.

Application of heat has been used successfully for paraffin removal from sand faces and a half century ago a Pennsylvania producer is said to have tried steam injection in his wells.

As early as August 9, 1920, Frank A. Howard of Standard Oil Development Co. filed application for a patent on *in situ* combustion as a method of secondary recovery. His application was granted on November 6, 1923 as U. S. Patent No. 1,473,348.

Mr. Howard proposed to inject a combustible mixture of air and gas into a central input well and ignite the mixture by electrical resistance. After combustion was begun, gas injection would be discontinued since air and vaporized formation oil would support combustion.

Ben E. Lindsly of the U. S. Bureau of Mines suggested in an article in the December 20, 1928 issue of *Oil & Gas Journal* that methane gas heated to 2,400° F would be effective in secondary recovery. He stated that gas injected at high pressures and temperatures would crack part of the oil in place and by reducing its viscosity aid in moving oil from input to producing wells.

Russian researchers began laboratory studies of *in situ* combustion in 1933 at the Grozny Petroleum Research Institute and subsequently pilot tests were conducted in the Shirvanui field in a zone which had been exhausted by ordinary pumping followed by vacuum application. The Russians also tried injecting hot gases under pressure. The pilot test output wells produced 570 Btu gas and crude oil which gave evidence of underground cracking. Later commercial applications were not successful and were abandoned.

In the January and February 1954 issues of the USSR magazine *Neftyanoe Chozyaestvo* (Petroleum Industry), an account is given of experimental work in Russia which suggests that the injection of hot water to promote secondary oil recovery is economically feasible. The article as published herewith has been condensed by elimination of the many complicated mathematical calculations of the authors.—*Editor.*

THE RESOLUTIONS of the 19th conference of the Party lay a compulsion upon those engaged in oil research and production to increase the volume of petroleum to be obtained in the course of the five-year plan now under way, to the extent of 85 percent. The accomplishment of this task makes imperative the utilization of the great reserves of the petroleum industry.

Large reserves of stocks of petroleum are preserved in depleted petroleum layers. The employment of secondary methods looking to the winning of petroleum does not solve the problem respecting the complete extraction of the stocks of residual petroleum.

It is possible to extract the petroleum remaining in depleted layers by the method of thermal treatment of the layer. However, works carried out by the Institute of Mineral and Fossil Fuels of the Academy of Sciences of the USSR and Mayneft in the year 1934 and in the years 1937-1939, in the Chusovsky Yards in 1935, and in Grozneft in the Starogroznensky industries in 1936, and also the works of R. T. Zakirov in Ukrneft in the years 1947-1949, were discontinued on the ground that they failed to yield any industrial results worth while, and the problem of thermal treatment of the layer was relegated to oblivion. However, the importance for the State that attaches to the failure to utilize the reserves of the petroleum industry is such that it does not permit of removal of the question of thermal treatment of the layer from the agenda of work to be done along these lines.

In the present article there is presented an analysis of phenomena that come about in the process of the thermal action that is exercised upon the layer, and actual conditions are found for the execution of thermal treatment of the layer on an industrial scale in an effective and economically feasible manner.

The actual layer cannot be regarded as

*Condensed from Jan. & Feb. 1954 issues of the USSR magazine *Neftyanoe Chozyaestvo*.

a thermally isolated object. The heat-conducting properties of the petroleum layer practically do not differ from the heat-conducting properties of the medium surrounding it—caprock and base. Closer to reality is the proposition that the layer and its surroundings can be considered to be a thermally homogeneous medium.

Temperature changes at one point in such a medium are diffused in all directions as a result of the heat conductivity. The heating of the medium in the direction of the layer can be done only by means of introduction of a hot agent into the layer. The agent of heat injection, by moving along the layer, increases the temperature of it. At the same time there takes place an outlet of thermal energy in the surrounding medium of the layer. The effect of the thermal treatment of the layer depends upon the sums of the heat exchange. The positive effect of the heat exchange between the skeleton of the layer and the agent of heat injection decreases, but sometimes it is destroyed by the negative effect of heat exchange between the layer and the surrounding medium.

It is obvious enough that there is no chance of eliminating the outlet of thermal energy from the layer or even of limiting it. However, there are possibilities of setting up rates of the thermal process inside the layer by means of the selection of the quantity and quality of the agent that is forced in and in this way regulating the process of the thermal treatment of the layer.

The process of thermal treatment of the layer is an energetic process. With the increase in the rates of heat injection the coefficient of the useful action of this process increases. If we take for granted that the scales of heat injection are sufficient in order to make it possible to disregard the losses of energy as a result of the heat conductivity, then a heat-injection temperature wave, not distorted by heat losses, will become diffused along the layer. The study of the laws of the diffusion of the heat-injection temperature wave in pure state is very important as are the essential rates of injection.

The most effective agents of heat injection appear to be water at a temperature of 200°C and higher, as well as saturated steam at pressures of 80 kg/cm^2 and higher. Superheated steam, however, loses some of its qualities in heat injection.

It has repeatedly been shown by laboratory experiments that a temperature of 150-200°C is fully sufficient for the extraction of almost all the petroleum from sandstone. At such temperatures of treatment of the layer, water is the most effective agent for injection. The petroleum surface, which can be treated with water in one year, requires about four years for steam treatment, and for a gas treatment the time required is 12 years. In the actual layer, the front of the thermal injection wave cools in the course of time as a result of heat losses, and therefore a heat injection treatment of the layer protracted too long cannot be productive of any effect. The positive effect of the process of heat injection depends basically upon the rate and scale of the thermal treatment of the layer. Best rate of heat treatment is possibly secured by the injection of hot water into the layer at a temperature of 200-250°C.

An excess of temperature in the injection water is essential for compensation of the temperature losses in the layer.

The diffusion of the heat injection temperature wave under actual conditions has a connection with heat conduction losses both in the radial direction and through the ceiling and base of the layer. Radial losses of thermal energy occur in the main in the front zone of the temperature wave.

The velocity of the movement along the layer does not change in the presence of heat losses. Changes in temperature, occurring as a result of radial heat conductivity, are not of any great practical importance, since these changes do not impinge upon the deeper lines of the temperature wave. Losses of thermal energy through the ceiling and base of the layer make themselves felt more substantially on the profile of the temperature wave.

As a consequence of these heat losses, the temperature profile of the whole portion of the treated layer changes, but losses of this type do not influence the velocity of the diffusion of the process of heat injection in the layer.

A more thorough study of the heat losses of the layer is very important for the determination of the essential scales of the process of heat injection, such as are able to produce a positive effect of the thermal treatment of the layer.

With the radius of the treated stratum at 100 meters, it has been calculated that 200°C water should be injected into the layer at a rate of 17.5 cubic meters per hour. The duration of a complete heat treatment of this part under the conditions stated above is three years. By a reduction of the radius to 50 meters and by an increase of the volume of injected water to 25m^3/hr, it is possible to complete the treatment of the entire area in six months. These figures presented here are fully acceptable and in many cases are realizable in industry.

There are possibilities for multiple reduction of the heat expenditures on the entire process of thermal treatment of the layer even at lower rates of injection of the thermal agent than are stated above.

The thermal treatment of the layer is effected basically in the frontal zone of the temperature wave. Losses of thermal energy take place only in the treated hot portion of the layer through which the hot heat injection agent passes. After a sufficiently deep temperature impulse has been created in the layer there is no longer any necessity of injecting the hot agent into the layer.

The temperature impulse can sweep further along the layer ahead of a continuous injection of cold agent. Then the heat impulse breaks away from the walls of the drill hole and, moving in a radial direction along the layer, it effects alternate treatment of the entire heat injection field aimed at. From behind the temperature impulse there takes place a fluctuation of the temperature of the operative agent to the temperature of heat injection. The thermal treatment of the layer in the frontal zone of the temperature impulse is effected exactly in the same manner as in the case of continuous injection of hot agent into the layer.

The radial thermal losses of the tem-

perature impulse occur both in the direction of the untreated portion of the layer and also in the opposite direction of the treated portion of the layer.

If the theoretical temperature profile of the impulse on the boundary of the treated portion has the shape of a quadrate, then the radial heat losses cannot exceed one half of the lateral heat losses. A general gradient of the temperature in the center of the quadrate impulse, brought about by joint lateral and radial losses of thermal energy, cannot exceed the temperature gradient brought about solely by a lateral heat conduction current by more than 50 percent.

The effect of the thermal treatment of the layer depends upon the amplitude of the temperature impulse that has reached the boundary of the treated portion of the layer.

The heat current emanating from the trunk of the drill hole in the surrounding medium can be regarded as an unstable flat-radial current at a constant gradient of temperatures.

Heat losses at slow rates of heat injection can nullify the entire effect of thermal treatment of the layer. At adequate scales of the process of heat injection, only a small portion of the heat current is lost. For example, when water is injected into the layer at a temperature of 200°C in a quantity of 20 m^3/hr., which corresponds to a heat current of 3,100,000 kcal/hr., there is lost in the trunk of the drill hole from 10 to 20 percent of the capacity of the heat current, the figure depending upon the duration of the injection. The magnitude of the losses of the thermal energy in the trunk of the drill hole is approximately of the same order as the magnitude of the heat losses on the layer. However, the losses in the trunk of the drill hole may be reduced by utilizing a heat insulator such as thick-walled plastic compressor-pump pipes. The heat insulation properties of plastic mass are from 10 to 15 times better than the insulating properties of sedimentary rocks. In this way it is possible to limit the losses of the heat current in the trunk of the drill hole to two to four percent.

The properties of the actual petroleum layer are far from homogeneous.

The permeability of one and the same layer changes within wide limits both along the vertical and along the horizontal dips. The vigor of the layer usually is inconstant.

The forms of petroleum surfaces are different. Along petroleum layers depleted by secondary methods of winning petroleum there are washed-out or blown-through paths of bypasses from the injection to the exploitation drill holes along which the injected agent easily slips from drill hole to drill hole without touching upon the depths of the layer.

The heat conduction properties of the layer and of the medium surrounding it also change within more or less wide limits. The network of exploitation drill holes is not always proportional. This picture becomes complicated further by tectonic breaches, cracks or impermeable boundaries of displacements or thrusts.

Under such conditions an exact calculation of the process of heat injection is not possible. Nevertheless, an approximate calculation on the basis of which it is possible to determine without error the scales and rates that ensure an effective industrial treatment of the layer does not offer any difficulties.

The surface of the zone of heat treatment of the layer will have a shape approximately like that of the zone of enclosure that is obtained in any ordinary build-up. Having studied the materials of a given deposit that have accumulated for the period of secondary exploitation, we are able to determine with satisfactory approximation for practical purposes the shape and volume of the portion of the layer lending itself to thermal treatment with a given injection drill hole. Let us assume here that the surface of the portion of the layer found in this manner equals 1 hectare, which at the vigor of the layer h = 20 meters gives 200,000 m^3 of sandstone subject to thermal treatment.

For the full treatment of this part it is absolutely essential to inject into the layer 153,000 m^3 of hot water. If we set for ourselves the goal of conducting the thermal treatment of the layer at a temperature in the front zone of the heat wave not less than 140°C, with temperature of the injected water at 200°C, and with normal temperature of the layer at 25°C, we find the resulting maximum duration of the process of heat injection to be five and one-half months. The rate of injection of hot water into the layer will be 900 m^3/24-hr. day.

The actual possibilities of injection of such a quantity of water into the layer are contingent upon the coefficient of productivity of the drill hole. If, for example, the productivity of the drill hole is 1 m^3/1 kg/cm^2 per 24-hr. day with viscosity of petroleum four centipoise, then for the hot water at a temperature of 200°C this coefficient will be 24 m^3/1 kg/cm^2 per 24-hr. day. In a given case it is possible to inject the quantity of water (900 m^3/24-hr. day) essential for a successful execution of the process of heat injection at a pressure upon the drift of the drill of 38.5 kg/cm^2. It is not a difficult matter to create this pressure by the weight of the water column itself in the drill hole.

The vigor of the heat injection current at such a quantity of injected water is 5,800,000 kcal/hr. In order to create this quantity of heat it is essential to burn more than 600 kg of fuel per hour, or about 15 tons of fuel in 24 hours. The heating of the entire quantity of the injected water can be done in 10 boiler installations of the standard locomotive type.

By treatment of the layer according to the method of thermal impulse, we can stop the injection of the hot agent after the lapse of a certain interval of time and continue the injection into the layer with a cold operative agent. Let us assume that in a particular instance it is sufficient to inject the hot agent for a month and a half for the creation of a quadrate profile of the heat impulse on the boundary of the treated portion. Then there will be expended on the treatment of the given portion of the layer 700 tons of fuel.

At average porosity of the treated portion of the layer m = 0.25 and at residual petroleum saturation of 0.36, the overall reserve of the residual petroleum in the entire volume of the treated portion amounts to 18,000 m^3. If only two thirds of these reserves of petroleum should fall into the first line of exploitation drill holes, but one third should be crowded over to the following line of drill holes, then as a result of the thermal treatment of a portion of the layer having a surface equal to one hectare, it is possible to extract in the course of a half year 12,000 tons of residual petroleum. One heat injection installation can in the course of a year, with the method assumed, treat up to four hectares of petroleum surface and produce up to 50,000 tons of petroleum.

In the light of such effect, the postulated method of thermal treatment of the layer is worthy of attention.

Some technical difficulties may arise in the transition from a hot agent to a cold one when as a result of increased viscosity of the cold water the pressure of injection increases approximately six-fold, in our example up to 230 atmospheres. With a drill hole depth of the order of 1,500 meters, cold water must be injected into the drill hole under the pressure of 80 atm. at the mouth of the drill hole. With a slight permeability of the layer, it is advisable to drill the injection fields, reducing the expenditure of hot agent and reducing the pressure of the injection at the time of transition to the cold agent.

CONCLUSIONS

1. Experiments with thermal treatment of a layer that have heretofore been conducted have not yielded any industrial effect for the single reason that the rate and scale of the process of heat injection employed have been far from sufficient and, moreover, use has frequently been made of heat injection agents of poor quality.

2. The utilization of hot water as heat injection agent at a temperature of 200°C or of saturated steam at pressures above 80 atm. and a corresponding increase in the rate of injection into the layer of heat injection agent ensure a successful solution of the problem of extraction of residual petroleum from the layer.

3. The proposed impulse thermal injection method of treatment of the layer is economically feasible.

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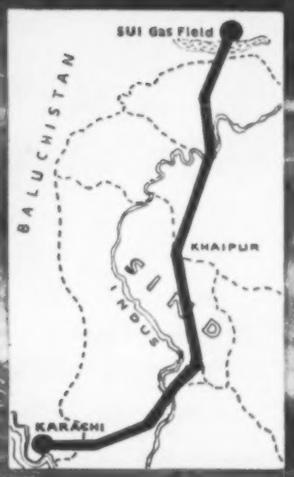

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Frank M. Porter, president of the American Petroleum Institute, addresses the Desk & Derrick convention.

New York D. & D. group at Banff: left to right, Adelheid Schneider, Marge Allstrom, Betty Van Kuyk, and Edna Hurry, newly elected chairman of public relations for 1955.

Desk and Derrick Convention

(*Continued from page 56*)

formed the Association of Desk and Derrick Clubs of North America. The purpose of Desk and Derrick is clearly stated in the by-laws of the association: "To promote among the women employed in the petroleum and allied industries, through informative and educational programs, a clearer understanding of the industry which they serve to the end that the enlightenment gained thereby may increase their interest and enlarge their scope of service."

On this premise, fifteen clubs representing 1,500 women members actively engaged in all branches of the petroleum industry were formed and received charters of the association. By July 1952 forty clubs representing 4,500 members had been formed and chartered. As of August 1954, Desk and Derrick had grown to 96 chartered clubs with approximately 9,000 members. This membership includes women executives, geologists, editors, draftswomen, secretaries, stenographers, auditors, accountants, bookkeepers, clerks—any woman actively engaged in the industry as defined by the Association and meeting the requirements of the member club.

All Desk and Derrick programs, with the exception of occasional business sessions, are devoted to some phase of the complex petroleum industry. Members hear prominent speakers on topics ranging from drilling to marketing, see oil industry motion pictures and participate in discussion groups. Programs are designed so that women in all segments of the industry can learn more of the industry as a whole. The association's by-laws provide that eighty percent of all regularly scheduled programs of a member club shall be devoted to the purposes outlined above.

Regular field trips are made by membership groups to all types of petroleum installations and are an important part of Desk and Derrick activities, adding reality to speeches and lectures. Excursions have been made to many drilling sites, both inland and offshore, refineries, pipe lines, tank farms, asphalt plants, experimental stations, supply sources, service installations and research centers in the United States, Canada and Mexico.

Education with respect to their industry and closer fellowship are among the prime objectives of the association membership. Nonetheless, other activities have been many and varied: Desk and Derrick members have assisted with the registration of oil men at their meetings and conventions, such as the great Tulsa oil show, AIME and IPAA; provided scholarships to further the study of petroleum; studied self-improvement courses in conduct and appearance; contributed toward development in leadership; and conducted seminars in geology, engineering, oil and gas laws, parliamentary law, speech, job clinics and a work shop for the exchange of ideas. Member clubs have also established lending libraries and helped with other oil industry educational programs in their communities, such as those sponsored by the Oil Industry Information Committee of the American Petroleum Institute and have sponsored floats in local parades. Theirs is a well-rounded public relations program unequalled by women employees of any other industry. Through self-education they strive to become better employees and to enlarge their scope of service and usefulness with a desire to familiarize themselves with a wide range of essential business functions foreign to their own experience.

In these efforts, Desk and Derrick has had the fullest cooperation of industry leaders who have given freely of their time, effort and knowledge, speaking at meetings and cooperating with arrangements for hundreds of field trips by Association members. Management's recognition of the tremendous value of Desk and Derrick, as demonstrated by active and continued interest and support of Association activities, has contributed greatly to the organization's success and its outstanding growth. The first Desk and Derrick convention was held in Houston, Texas, September 12-13, 1952, with an attendance of approximately 1,000 members. Founder Inez Awty Shaeffer was the keynote speaker and presented the keynote address, "Extended Horizons," prophetically stating: "If we can achieve what we have set out to do, we will not only extend our horizons, they will become unlimited."

The second convention, held in Denver, Colorado September 11-12, 1953, again drew an attendance of nearly 1,000 D. and D. members. Lee Wilson Hoover, the first president of the Desk and Derrick, was the keynote speaker and called upon Desk and Derrick members to march forward under the general convention theme of "Greater Knowledge—Greater Service." She stated: "We have brought together women in the petroleum industry throughout North America to such an extent that geographical boundaries have ceased to exist."

This year's convention, the third, at Banff, Alberta, Canada, September 7-8, amid the awe-inspiring majesty and beauties of the great Canadian Rockies, was attended by nearly 600 D. & D. members despite the great distance and time involved. Margaret Neff of Jackson, Mississippi, the immediate past president of Desk and Derrick (1953), was the keynote speaker. She delivered a rousing and inspiring talk, "Open Doors," which emphasized and developed the convention theme "Knowledge Gained—Understanding Assured."

Desk and Derrick membership is drawn from eight regions, the last having been added to the original seven through a split-up of original large Texas, New Mexico and Arizona region.

Other officers elected at the Banff convention include Miss Edna Hurry of New York City, office manager for Standard Oil Company (New Jersey), as first vice president. As public relations chairman for 1955, Miss Hurry and her New York D. & D. club will have the full responsibility for the 1955 D. & D. convention which is to be held in New York City. Also elected was Miss Minetta Miller of Denver, Colo., private secretary to E. S. Baker of Denver Oil Co., formerly assistant secretary of the Sioux Oil Company of the city, as second vice president. Nelle Barclay, secretary to Frank M. Porter, president of the American Petroleum Institute, New York City, and of Fain Porter Drilling Company of Oklahoma City, Okla., was elected secretary of

(*Continued on page 71*)

Butterley at home and abroad . . . .

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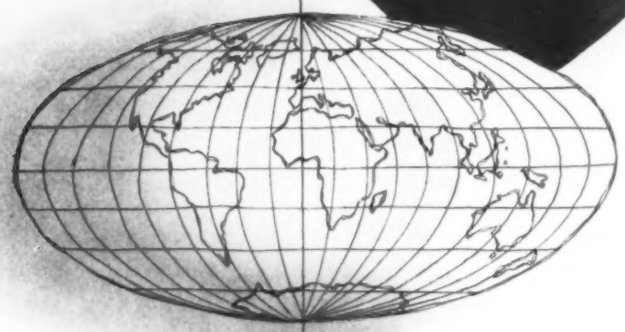

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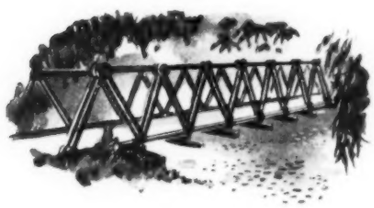

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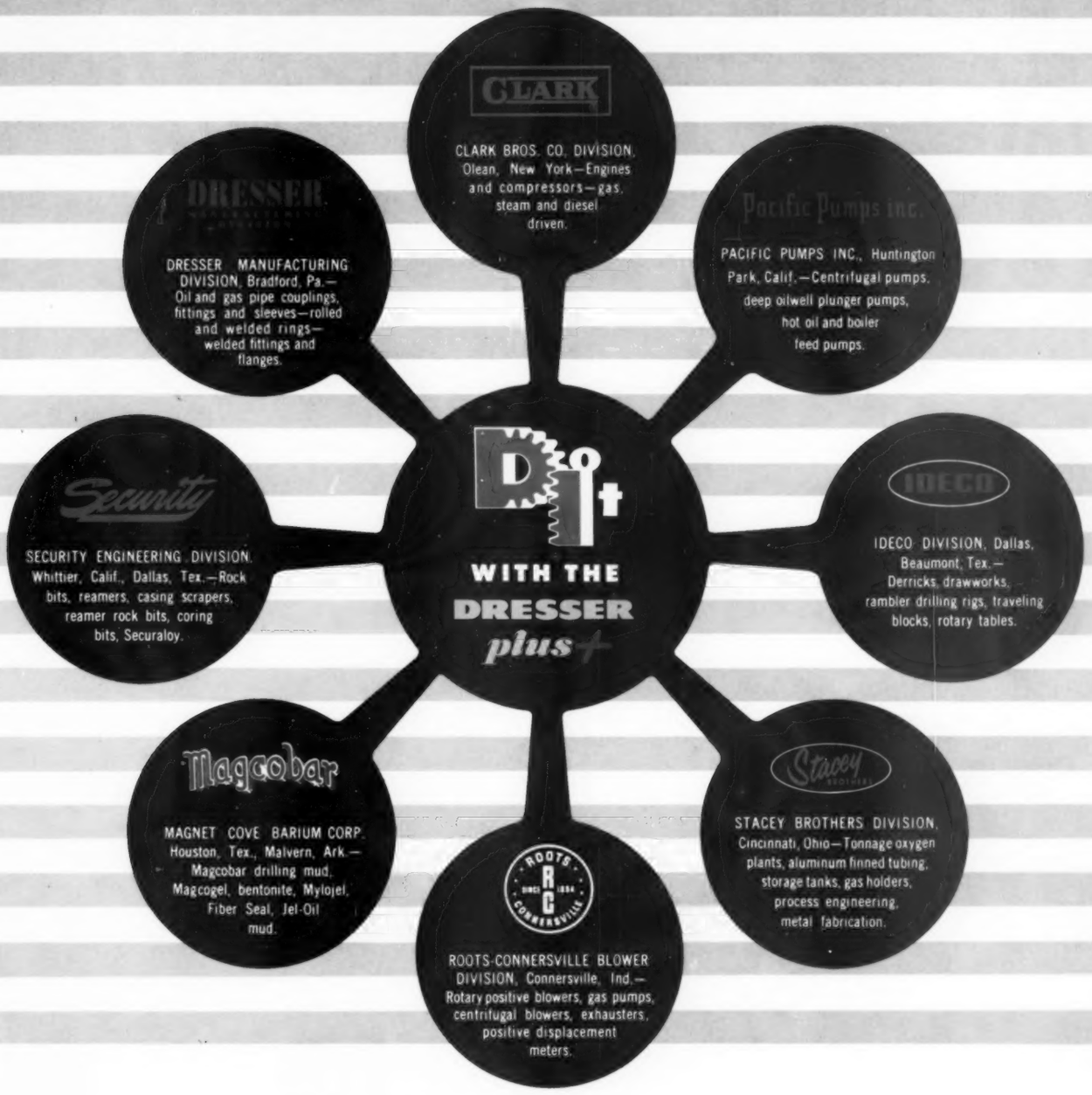
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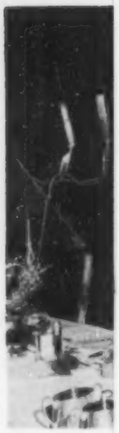

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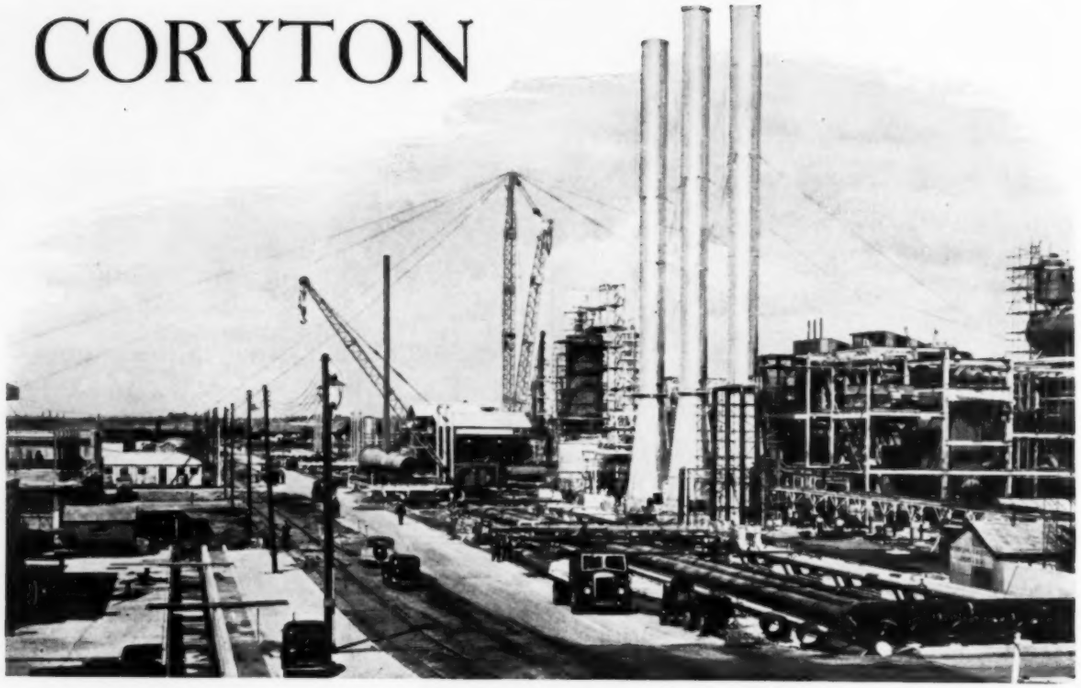

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D. & D. board of directors for 1955: back row, left to right, Doris Rooney, Leta Dillon, Irene Cox, Angela Cross, Pauline Colahan, and Irma Cline. Front row, Nelle Barclay, Minetta Miller, Sybil Sureck, Edna Hurry, Frankie Frensley, and Betty Conley.

A Calgary barbecue — chicken, ribs and steak — enlivened activities at Banff.

Desk and Derrick Convention

(*Continued from page 66*)

Desk and Derrick. For treasurer, D. & D'ers elected Frankie Frensley of Dallas, Texas. Miss Frensley is secretary-treasurer of Daltex Oil Co., Daltex Petroleum Corp. and Scyene Investment Company, and affiliated with William P. Luse, oil investments, of Dallas, Texas.

Together with the above officers, a group of eight regional directors form the board of Desk and Derrick. Those elected for 1955 at Banff were: Miss Angela Cross, Plymouth Oil Company, Pittsburgh, Pa., director for Region One, comprising the states of Connecticut, Delaware, the District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, Virginia, and West Virginia in the United States, and the provinces of Ontario, Quebec, New Brunswick, Nova Scotia, Prince Edward Island and Newfoundland in the Dominion of Canada.

As director of Region Two, comprising the states of Illinois, Indiana, Iowa, Kentucky, Michigan, Minnesota, Missouri and Wisconsin, Desk and Derrickers elected Miss Catherine E. G. Connell, secretary to J. M. Doss, assistant territorial manager of The Texas Company, Chicago, Illinois. Miss Connell was first president of the Chicago D. & D. club, which she helped organize, as well as the Detroit and Milwaukee D. & D. clubs.

Mrs. Bettie Conley, associated as executive secretary with the William Helis Company, independent oil producers of New Orleans, La., was elected director for Region Three, which comprises the states of Alabama, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina and Tennessee. Miss Conley also supervises female personnel for the Helis organization and at the same time is the secretary of the Royal Creek Consulate in New Orleans, which office has jurisdiction over five states.

Elected director of Region Four was the attractive Mrs. Eloise Limbocker, confidential secretary in the industrial relations department of The Texas Company at Port Neches, Texas. Miss Limbocker was a charter member of the Beaumont Desk and Derrick club, served as its first vice president in its organizational year and as its president the second year. She attended both the Houston and Denver D. & D. conventions as delegate, and in 1954 served as immediate past president of the Beaumont Desk and Derrick club and as area coordinator of the South Texas area of the old Region Six.

Region Four was formerly part of one D. & D. region which embraced all of Texas. Region Five now comprises the states of Arizona, New Mexico and the western portion of Texas bounded on the east by the easterly boundary lines of Clay, Jack, Palo Pinto, Earth, Hamilton, Lampasas, Burnet, Blanco and Kendall counties, and in the south by the southerly boundary lines of Bandera, Real, Edwards and Val Verde counties.

Miss Irma Cline, office manager for Nelson, Montgomery, Robertson & Sellers, a firm of oil lawyers in Wichita Falls, Texas, was elected director of the newly formed Region Five. Miss Cline formerly worked for the drilling firm of Huckleberry & Cline. She was a charter member of the Wichita Falls D. & D. club, was parliamentarian for the year 1951, corresponding secretary in 1952, and is currently the 1954 president.

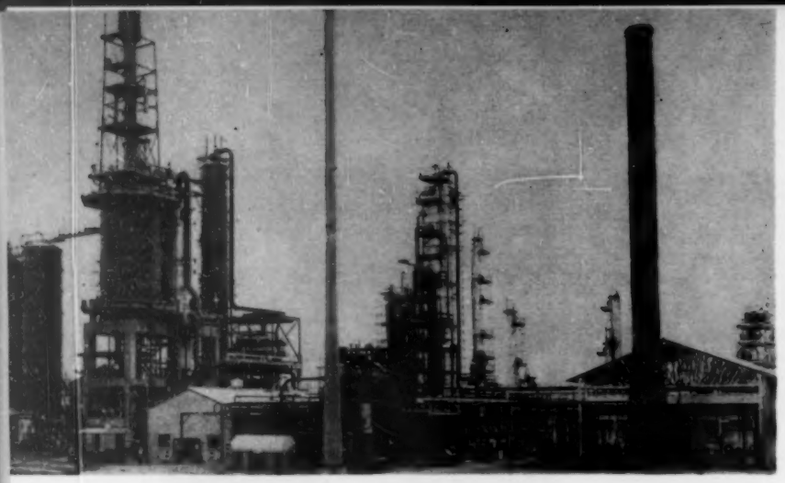
Election of Miss Leta Dillon to the directorship of Region Six, comprising the states of Kansas, Nebraska and Oklahoma, gives this area a top-caliber woman long experienced in both petroleum and Desk and Derrick affairs. She has been in the employ of Deep Rock Oil Corporation of Tulsa, Oklahoma for the past ten years in the marketing and accounting department, presently having the care of fixed assets ledgers in the property accounting department. A charter member of the D. & D. club of Tulsa, Miss Dillon was president in 1953 and has served on the board for four years. She has also been chairman of the program and publicity committees for the seminar for Region Two held at the University of Tulsa this year. As a member of the association distribution office committee, Miss Dillon was largely responsible for preparing Tulsa's successful bid for the national headquarters office of Desk and Derrick.

Mrs. Doris Rooney's election as director of Region Seven gives this live petroleum area, comprising the states of Colorado, Montana, North Dakota, South Dakota, Utah and Wyoming and the Provinces of Alberta, Manitoba and Saskatchewan of the Dominion of Canada, an experienced and capable woman oil executive. Mrs. Rooney is vice president and secretary-treasurer of F. F. Reeve and Company Ltd. a well known Calgary brokerage firm, and is secretary of Ace Oils Limited, a privately owned oil company. She has been employed by Commonwealth Petroleums Ltd. (parent company of Commonwealth Drilling Company Ltd., Canada's largest drilling company) since 1937 as secretary to F. F. Reeve, president, and in 1948 was elected a director of the company, in which capacity she has continued her work.

Election of Miss Pauline Colahan as director of Region Eight, comprising the states of California, Idaho, Nevada, Oregon and Washington, the Province of British Columbia and the Territory of Alaska, brings a well educated and well travelled woman to this post.

Miss Colahan is a graduate of the University of California and did graduate work at the University of Hawaii and the Sorbonne in Paris. She taught in the public schools of Puerto Rico and held her first oil job in the production office of the Mene Grande Oil Company, a subsidiary of the Gulf Oil Corporation. Since her return from war service with the Women's Army Corps in England, France and Germany, Miss Colahan has been working for the geological, engineering and accounting departments in the San Joaquin Valley division offices at Bakersfield, Calif. She is a charter member of the Bakersfield Desk and Derrick Club (1953-54) and served on the board of directors as acting junior past president.

She was editor of the *Roustabout* during 1952-53 and assistant editor of the national association's bulletin *Oil and Gal* during 1953.



View of the combination unit at the Mandan, No. Dak. refinery of Standard Oil Company (Indiana).

MANDAN refinery has formal opening

FORMAL DEDICATION of the refinery of Standard Oil Company (Indiana) at Mandan, North Dakota, newest and largest industrial plant in the state, took place on October 2. The dedicatory address was delivered by Gov. C. Norman Brunsdale of North Dakota. Dr. Robert E. Wilson, chairman of the board of the oil company, A. W. Peake, president, other members of the board of directors and Thomas E. Stockdale, manager of the refinery, took part in the ceremonies.

Development of oil production in the Williston Basin is directly responsible for establishment of the refinery at Mandan. Although extensive surveys and some test drilling had been carried on in earlier years, general recognition of the area as an important oil province dates from the bringing in of the discovery well of the Beaver Lodge field in 1951 by Amerada Petroleum Company. An active drilling campaign followed, but actual production was held down by the lack of storage and means of transportation.

With the available crude supply constantly expanding, the need for a processing plant was evident and after examination of a number of possible sites Indiana Standard selected a 900-acre tract about a mile outside of Mandan as the most convenient and began preparation for construction at the beginning of 1953.

Having regard to the supply of crude available, a refinery capable of handling a daily throughput of 30,000 barrels was decided upon. Since Williston crude is of relatively high gravity with very little sulfur or metals content, it offered no unusual problems of treatment in a plant designed to turn out the major products mainly in demand.

Crude coming into the refinery is first passed through the Petreco desalter and then goes to the crude distillation section, where it is heated under pressure to separate the light fractions from the heavier constituents. The catalytic cracking unit is a modified Model IV design with a 15′-6″ x 41′-7″ reactor and a 23′-6″ x 38′-3″ regenerator. The unit holds about 175 tons of catalyst which circulates between the two vessels every ten minutes.

Overhead the cat produces wet gas and unstable gasoline. From three sidestreams it produces light and medium cycle oils, which are used in blending into distillate fuels, and heavy cycle oil, most of which is put through the cracker again, but some of which is used as refinery fuel.

Light naphtha from the initial crude distillation and wet gas and unstable gasoline from the cat cracker move to the vapor recovery section. Here the mixture is separated into dry gas, wet gas for polymerization, and stabilised naphthas, both light and heavy. The naphthas are the basis for the gasolines.

The wet gas (C_3-C_4) in its turn moves to the polymerization section, which is the reverse of the catalytic cracker. In the cat cracker heavy molecules are split into lighter fractions. In the polymerization unit lighter fractions are united into heavier ones suitable for gasolines. The unit is of the conventional UOP type with a Girbotol Unit for the removal of hydrogen sulphides.

Facilities for four processes, distillation, catalytic cracking, vapor recovery, and polymerization, are physically integrated at Mandan. The crude-distillation and fluid catalytic cracker sections are back to back, with pumps in a single pump house handling the high temperature stocks between the two sections. Similarly the vapor recovery and polymerization sections are back to back, with pumps in a single pump house handling light hydrocarbons between the two sections.

In the treating and blending unit of the refinery the products are stripped of their contaminants by various processes and then blended to the specifications required for finished products.

Storage provided at the refinery consists of 53 tanks with a total of 2,770,000 barrels capacity. This includes six tanks of 96,000 barrels each and two of 20,000 barrels for crude and casinghead storage, the remainder consisting of storage facilities for gasoline, kerosine, diesel and gas oil, various grades of fuel oil, water supplies for fire fighting and tanks for emergency use.

Mandan gets its crude oil supply by way of a pipe line from Tioga to the northwest. Service Pipe Line Co., a wholly-owned subsidiary of Standard, put in the 12- and 16-inch line over the 156-mile dog-leg distance. Earlier, Service had put in the first crude oil gathering lines in North Dakota.

Construction work on the pipe line was begun June 15, 1953. On November 20, 1953, the line reached Mandan. Before the refinery went on stream crude was moved into storage tanks to insure an initial working stock.

At present the pipe line has a capacity of 30,000 barrels a day so it will fully supply Mandan's requirements. The line was designed and built so that its capacity can be increased to 100,000 barrels a day by the addition of pumping stations.

For the relatively small proportion of the refinery's products which will move to market by rail or by truck, an 18-spot car-loading rack is located nearby with storage space for 75 railroad cars. A two-spot truck rack is provided to load trucks serving this area.

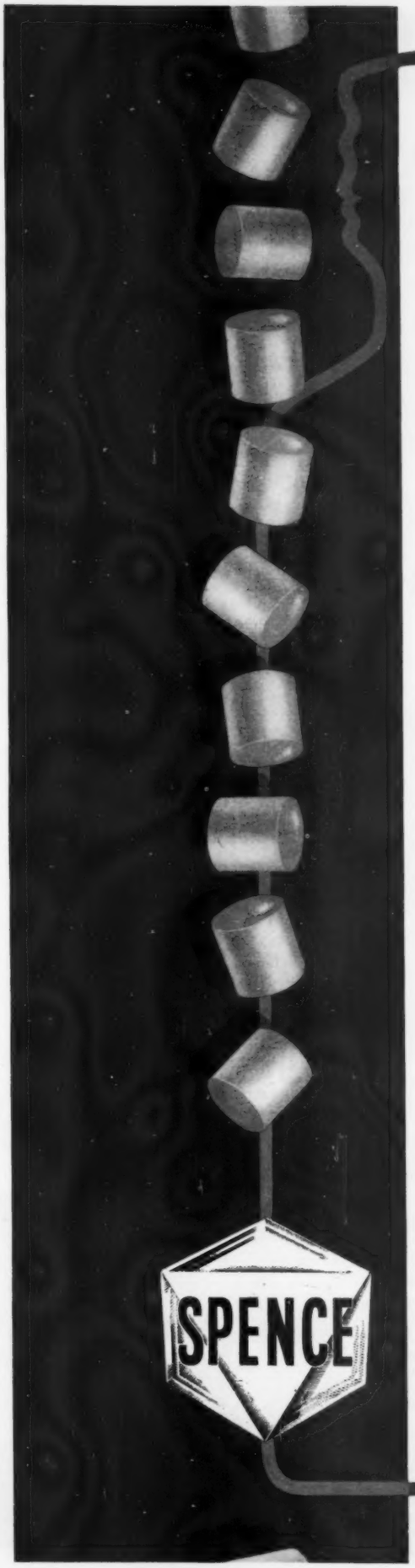
Most of Mandan's output, however, will move eastward through Standard's own products pipe line to Moorhead, Minn. There the line links with the rest of Standard's 2,174 miles of products pipe lines that lace together the states of the Middle West.

Since the late fall of 1953 this Mandan-Moorhead line has been carrying products for distribution in central and North Dakota westward from Moorhead. With the Mandan refinery on stream, the flow has been reversed. Mandan is supplying gasoline, power fuel, kerosine, heater oil, furnace oil, and diesel fuel east to Minneapolis.

Construction of the 200-mile products line was begun in June, 1953. On October 14, Standard began pumping products from Moorhead to Mandan. And on December 14, 1953, the first distribution of pipe line-delivered products was made from Mandan.

This 10-inch line has two stations at present, at Mandan and at Moorhead, and a third is planned for Jamestown, N. Dak.

(Continued on page 108)



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CANADA

Miss Betty Heaton, associate director of Desk and Derrick's Region Seven, Edmonton, introduces the Honorable E. G. Manning, Minister of Mines and Minerals of the Province of Alberta, who addressed delegates at the Banff convention of the Association of Desk and Derrick Clubs of North America September 8.

Canadian Petrofina Plant Started

Construction has started on a complete $20 million refinery for Canadian Petrofina Ltd., it is announced by The M. W. Kellogg Co., which was recently awarded the contract for the design of the major part of the processing units. Kellogg's wholly owned subsidiary, Canadian Kellogg Company Ltd., will erect the units and all of the off-site facilities. The refinery will be located near Montreal, the major refining area in Eastern Canada.

Much of the new plant will be of integrated combination design, eliminating considerable intermediate storage. It will also be designed with flexibility to handle both Middle East and Venezuelan crudes. Processing facilities include a 20,000 b/d, topping unit, vacuum flashing capacity of approximately 10,000 b/d, a 4,000 b/d vis-breaking unit, a 3,600 b/d catalytic reforming unit, catalytic polymerization and alkylation units with feed desulfurization facilities, 2,500 b/d distillate treating unit, and a 6,500 b/d gasoline treating unit.

Off-site construction will include a steam generating plant, a cooling water system, wharfage for tankers, crude oil and product storage, an office building, shops and extensive marketing facilities such as truck, rail and barge loading installations. The project is scheduled for completion in the latter half of 1955.

Fox Appointed Chief Geologist

H. D. Fox has been appointed chief geologist in Canada for Sohio Petroleum Co. He succeeds Rein de Wit, who has been transferred from Regina to Calgary as northwest division staff geologist reporting to J. Walter Johnson, division geologist. Mr. de Wit resigned from the Geological Survey of Canada to join Sohio. He previously had worked for Shell Oil Co. He is a native of Indonesia and received his geological education in Holland.

To Drill 12 Wildcats

Sapphire Petroleum Ltd. is now rigging and preparing to spud in a wildcat in the east Kirkella district of the Virden area of southwest Manitoba, it has been announced by Maxwell Goldhar, president. It will be the first of 12 wildcat wells Sapphire will drill in the Virden area this year.

Exhibits at Calgary and Regina

The Canadian Petroleum Association's public relations department cooperated with Seismic Service Supply Ltd. in the operation of an exhibit during the recent Calgary Stampede. The exhibit featured geophysical aspects of the industry, along with some production phases. More than 16,000 pamphlets depicting the progress of the petroleum and natural gas industry in Alberta, prepared by the CPA, were distributed during the week and it is estimated that approximately 80,000 people viewed the display. Another exhibit featuring exploration along with some production was prepared by the geophysical committee of the Saskatchewan division, and shown during the Regina exhibition. Pamphlets similar to the Alberta pamphlet, but outlining the growth of the industry in Saskatchewan, were prepared for distribution by the CPA.

A feature of the Regina display was a dry hole map which attracted considerable attention among the several thousand spectators.

Husky Earnings Higher

Consolidated net earnings of Husky Oil & Refining Ltd. for the six months ended June 30, 1954, totaled $105,362, compared with $102,923 in the like period of 1953. Sales of refined products totaled $2,692,463, as compared to $2,495,989 in the first half of 1953.

J. B. Sewell

Garlock Sales Manager

J. B. Sewell of Toronto has been appointed general sales manager of Garlock Packing Company, according to an announcement by George L. Abbott. Mr. Sewell will direct the sales of Garlock products through the company's 29 divisional offices throughout the United States and Canada. He takes over the sales duties of Louis Mohn, a vice president of the company, who is on sick leave, recuperating from an illness of many months' duration.

CPA Directors Elected

R. C. Brown, president and general manager of Hudson's Bay Oil and Gas Co. Ltd., was recently appointed to the general board of governors of the Canadian Petroleum Association by directors of the Alberta division.

O. I. Torkelson, vice president of Western Canada exploration and production department of British American Oil Co. Ltd., was appointed director of the division and B. Gillespie, president and managing director of Oil Well Operators Ltd., was elected second vice chairman of the division. These appointments were necessary due to the recent resignation of N. E. Tanner.

Work Begun on Canadian Lube Plant

Construction has begun on Imperial Oil's new $14 million lubricating oil plant at Edmonton, Alberta. The new lube plant will be the first in the west and the second largest in Canada—second only to Imperial's Sarnia plant. It is expected that construction will be completed late in summer of 1955. The plant will produce about 750,000 barrels of high quality automotive and industrial oil a year.

Canadian Company to Drill in Cuba

Cuban-Canadian Petroleum Company Ltd., a subsidiary of the American Le Duc Petroleum Co. of Edmonton, has signed an agreement in New York with a group of Cuban petroleum executives for oil exploration on 4,992,700 acres of Cuban oil land. American Le Duc owns operating properties in Canada, Pennsylvania and Wyoming.

The area covered by the agreement borders at one point on the new discovery well brought in last June in Camaguey Province. One part of the new Cuban-Canadian 30-year lease is within 400 yards of the Jatibonico wildcat now yielding approximately 150 barrels of oil per day. The total area covered by this agreement extends through five provinces in Cuba, namely: Matanzas, Havana, Las Villas, Pinar del Rio, and Camaquey. Drilling will begin within 90 days. Drilling equipment will be en route to Cuba within one week.

Officers and directors of the Cuban-Canadian Petroleum Co. Ltd. are:

Lowell M. Birrell, president of American Le Duc, chairman; John W. Meyer, Los Angeles, president; Hector Rivero, Havana, insurance executive; Eladio Ramirez, Havana, lawyer; Augusto Maxwell, Havana, lawyer; Thomas R. Cains, Edmonton, businessman; Hyman D. Lehrich, New York, attorney; and Pierre du Pasquier, Paris, France, partner of du Pasquier and Landau, members of the New York Stock Exchange.

Kent Director Visiting Canada

W. A. Hartop, works director of George Kent Ltd. of Luton, England, is on a two month visit to Canada during which he will make his headquarters with Kent-Norlantic Ltd., Canadian subsidiary of Kent, in Toronto.

The main object of Mr. Hartop's trip is to assist the production organization of Kent-Norlantic to get into full operation and to investigate further export prospects for George Kent products. In the course of his travels in the Dominion he will visit Kent-Norlantic agencies in the various provinces and will cover the whole country to the Pacific Coast.

W. A. Hartop

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Offer outer belt lands for lease

By Joseph B. Huttlinger

The outer belt of the offshore submerged lands finally is being offered for lease to oil and gas operators on the basis of award to the highest bidder. Bids have been invited for 199 tracts off the coast of Louisiana, to be submitted October 13 in Washington. The actual awards are expected shortly afterward and then it will be up to the winners to begin operations.

A second batch of offshore lands, these off the coast of Texas, has been chosen for offering, and a tentative date of November 9 has been set for the opening of the bids.

The 199 tracts off the Louisiana coast, which average 3,740 acres each, total 748,000 acres in all, and show up as a checkerboard pattern on the map. While the leasing represents perhaps the largest single offering of public lands, the area represents only an estimated five percent of the submerged region off the Louisiana coast.

Any oil or gas operator trying for a lease must agree to pay a royalty of 16 2/3 percent upon the finding of oil, a minimum rental of $3 an acre, plus a bonus which represents the area of competitive bidding. A minimum bonus of $15 an acre has been set.

Leases run for five years and as long thereafter as oil or gas is produced in paying quantities. The 199 tracts extend out as far as 50 miles from shore on the one hand and come in as close as about three miles from the coast on the other hand.

The call for bids and actual award of leases in the Louisiana area will leave a number of questions still to be settled. Some of them, in fact, are certain to go to the courts for adjudication. One is the location of the coastal boundary off Louisiana. Is it, for instance, three miles out, as some federal authorities claim? Is it 10.5 miles, the distance which is agreed upon for the Texas coast? Or is it 27 miles as some others claim, including Louisiana legislative bodies?

Beyond this, federal authorities are yet to confirm oil and gas leases awarded years ago by state officials in what is now regarded as the outer or federal belt of the offshore submerged lands. Under the tidelands act of August 1953, these are to be confirmed by the federal authorities. Further, a question arises as to the royalty to be paid, once they are confirmed, as the new oil leases are to pay 16 2/3 percent, while the leases granted by the states are paying 12 percent. Moreover, federal authorities are yet to return to the coastal states funds from offshore operations which have been held in escrow pending the determination of state and federal areas. Many, if not all, of these problems must await court settlement of the federal-state boundary.

In the field of sulfur, Secretary of the Interior Douglas McKay offered a total of 523,000 acres for lease, with the bids to be opened on October 13 also. The terms provide that leases shall be for 10 years and as long thereafter as sulfur may be produced in paying quantities. The royalty is to be 7.5 percent of the value at the wellhead, but not less than $1.50 a long ton; the annual royalty is to be at least $2 an acre.

Beyond this, Secretary McKay said that since the passage of the offshore lands act, the department has approved the drilling of 65 wells on leases previously issued by the state of Louisiana. The oil production is 8,900 barrels daily of crude oil, 1,500 barrels daily of condensate and 145 million cubic feet of gas. About 185 wells are on lands under the jurisdiction of the United States off the coast of Louisiana, of which 13 are drilling, 40 are producing oil, 16 are producing gas, with eight oil wells and 31 gas wells shut in. Further, 77 dry holes have been abandoned.

At present, the Secretary said, there are 290 leases issued by the state of Louisiana in the outer belt being validated by the Bureau of Land Management, embracing about a million acres of land.

Gas Producers Protest FPC Rule

The final fate of some 4,000 independent producers of natural gas facing rigid controls over their prices and sales volumes for the first time in history, will be known only when the Congress next year has a chance to study the situation, but meanwhile, the Federal Power Commission is taking steps toward exercising controls.

Acting on the basis of a Supreme Court decision on June 7, that the commission must exercise controls over prices of gas sold by some independent producers, the FPC ordered all producers to file by October 1 details of their prices and sales volumes. No changes are to be made either in the prices or the volumes sold without FPC permission, the commission ruled.

Reacting, some 100 natural gas producers objected and asked the FPC first to hold public hearings on its new exercise of authority. This the FPC held on September 22 in perhaps the most controversial hearing in its 16 years of existence.

Failing to move the commission, the gas producers may resort to the courts to delay action. Final decision probably will have to come from Congress at its next session when the question promises to provide one of the biggest battles in the legislative mill.

Women in the Petroleum Marine

Believe it or not, there are 30 women employed as sailors and deckhands in the petroleum transport industry.

There are 30 more as plumbers and pipe fitters, 30 machinists, 30 mechanics, 30 carpenters and 30 others as electricians.

A total of 60 are employed as painters, 150 as general foremen, and 270 as general laborers.

This, at least, is the report of the Bureau of the Census, which came up with the figures on the basis of a 3 1/3 percent sample of occupations in the industry.

The women go in for gentler occupations as well. Some 30 are music teachers; an equal number are lawyers, while another 150 are employed as social scientists.

The census bureau report, which showed a total of 228,300 men and 28,890 women employed in petroleum refining, also found the men engaged in some unexpected types of work.

A total of 90 men are hired as boatmen, canalmen and lockkeepers, and 390 as sailors and deckhands. Some 30 more are fishermen and oystermen, and 30 religious workers, while 30 are employed as veterinarians and 330 as blacksmiths.

The industry has 690 lawyers, of which 660 are men.

The Census Bureau thinks the figures are right, but there's always a chance, in making up a special report on the basis of a small sample, of error.

"Someone can punch the wrong key," accord-

(Continued on page 78)

"In the United States alone, there has been produced since 1938 as much oil as was known to exist in the country at that time. And despite that great withdrawal, the domestic industry's proved reserves are at an all-time high level. It's as though we started out with a tank of oil, used it all up, and had a bigger tankful left."

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ing to David Kaplan, chief of occupational statistics of the bureau, "and then we have an error."

On the basis of the sample used, if a census tabulator found one woman working as a sailor, he multiplied that by 30 to estimate the number of women engaged in this job in the industry.

Whatever it adds up to, the bureau report does indicate that the women, bless them, are as versatile as we thought they were.

Anti-Trust Division Keeps Eye on Oil

The anti-trust division of the Department of Justice has one out of each five persons on its staff dedicated to matters affecting the petroleum industry.

Stanley N. Barnes, the genial and capable head of the anti-trust division, told about it in an interview with this reporter.

He ticked off the areas being covered, as follows:

(1) The pending West Coast suit against seven major petroleum companies; (2) the suit against Sun Oil Co. at Philadelphia, which is yet to come to trial; (3) clearance for five American oil companies forming a consortium to develop Iranian petroleum; (4) the pending suit against an alleged oil cartel operating abroad; and (5) study of oil company offers to buy some of the government's synthetic rubber plants.

Beyond this, the anti-trust division is studying complaints that the industry is violating the anti-trust laws in its pattern of price changes including the so-called "follow the leader" plan. In general, the division keeps its eye on all signs of collective action by oil companies to make sure that the federal statutes are being observed.

FOA Reports on Foreign Trade

An on-the-spot checkup of some 22 petroleum projects in western Europe, financed at least in part by U. S. foreign aid funds during the past six years, has been virtually completed and a report is being written, it is disclosed by the U. S. Foreign Operations Administration.

G. Stribling Snodgrass, petroleum consultant in Washington and former U. S. Government official, spent four months touring Europe to gather the facts on the successes and failures of the petroleum projects, it is disclosed.

The report, which is being written for the attention of Harold Stassen, director of the FOA, also will be distributed to members of Congress, and may have a lot to do with congressional attitudes toward further foreign aid for the European petroleum industry, it is said.

Mr. Snodgrass is one of the seven industry experts sent abroad by the FOA to check up on virtually the whole range of capital improvements for European industry financed partly or wholly with U. S. funds as part of the recovery program.

In all, a total of 146 capital projects in Europe received aid from the United States during the past six years, and they were located in 13 different countries and dependencies. The total cost of the capital improvements adds up to $2.6 billion, and of this, the United States furnished some $600 million in funds or equipment.

The petroleum projects included 16 refineries, and six oil and gas drilling projects. The drilling projects are located in France (with five enterprises), and Austria (with one). Of the refinery projects, 10 are in France, one in Germany, three in Italy and two in the United Kingdom.

Record Gasoline Sales

Retail sales of gasoline service stations passed the billion dollar mark during August for the second straight month, it is estimated by the U. S. Bureau of the Census.

The estimated sales came to $1,007 million during August, a bit behind the July figure of $1,052 million.

The August figure compares with $960 million during the same month a year ago.

July marked the first month in history when the sales passed the billion dollar mark, the census bureau says.

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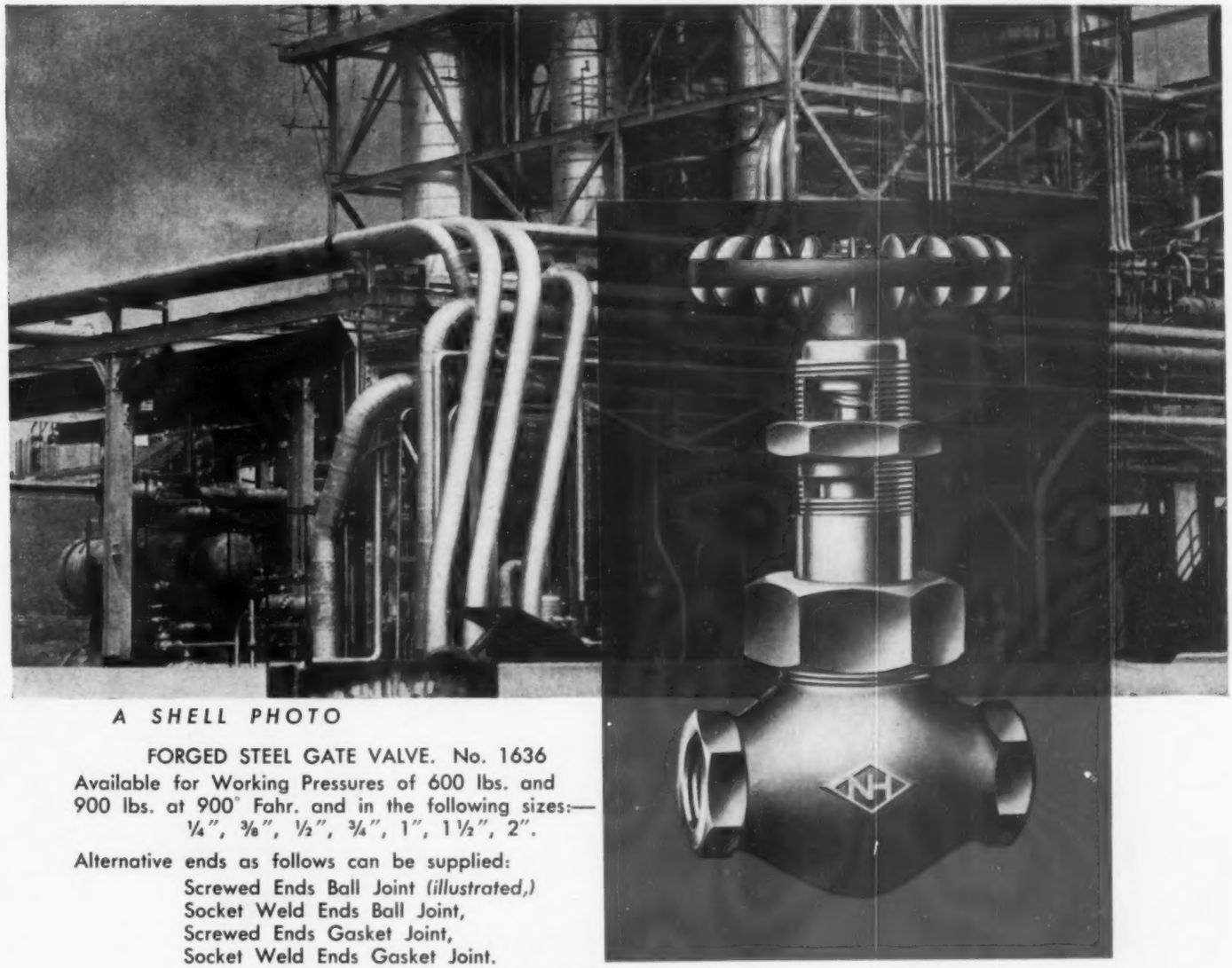

A SHELL PHOTO

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But, as the illustrations on this page show, this was only a beginning; since we first introduced PTFE in the form of Gland Packings we have gained considerable experience of the manufacture of various products from the basic raw material, and we have now used this material for many new, and in many cases entirely unsuspected, applications.

We are preparing a special series of pamphlets on our work in these fields. These pamphlets will be of interest to all concerned with the handling of these *problem* materials, and they will be sent to interested engineers who let us have their names and addresses.

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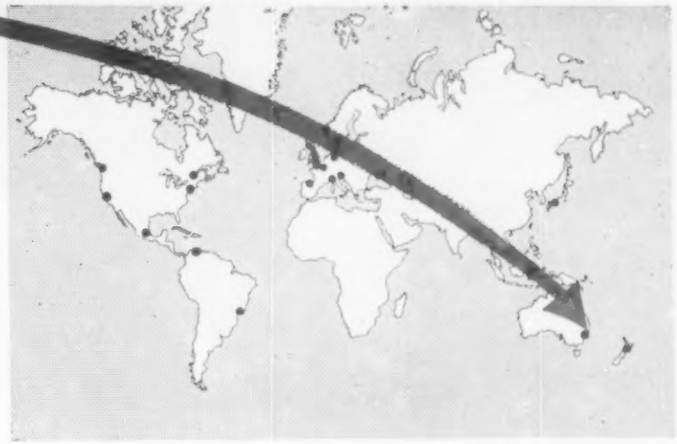

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BRITISH OIL NEWS

By E. Lawson Lomax

A statement showing the value of orders for materials and equipment placed in the United Kingdom by oil companies during the second quarter of 1954 shows that for this period, compared with the same months of 1953, there is an increase of nearly £2 million ($5.6 million).

It would appear that British manufacturers are now entering a period of fairly settled production after the years of rapid expansion following the war.

The sectionalized report of sales is as follows:

Geophysical and other exploratory equipment	£ 12,800
Specialized equipment for drilling & production including oil casing & tubing	1,204,500
Specialized equipment for refineries (not including pumps and valves)	583,900
Drum and can-making, filling & cleaning equipment, curbside pumps & other oil metering & dispensing equipment	310,200
Railcars, road tankers, aircraft refuellers	30,500
Drums, drumsheets & tinplate	1,796,700
Tankage (including tank fittings)	1,077,900
Tubulars, pipe fittings and valves (ferrous & non-ferrous)	1,801,200
Pumps (excluding slush, oilwell & curbside)	319,000
Boilers, boiler house plant & accessories	32,400
Electrical equipment (motors, generators & transformers)	1,255,700
Instruments, meters & gauges	288,200
Prime movers & compressors	546,100
Machine & hand tools, welding & miscellaneous machinery & stores	1,349,400
Ferrous & non-ferrous plates, sections, sheets & bars	448,700
Automotive equipment, all types	970,700
Laboratory equipment & chemicals including hospital & medical supplies	204,400
Bulk chemicals, catalysts & barites	4,359,400
Cement & other building materials & hardware, including timber	802,000
Commissary (general requisites for office, warehouse, household, club & sports)	1,045,600
	£18,439,300

COMPARATIVE FIGURES

1953	Total	£67,124,000
	Second Quarter	16,466,100
	First Half	36,583,700
1954	First Half	39,311,600

New Oil Show in Nigeria

A show of oil has been encountered by the Shell-D'Arcy Petroleum Development Company of Nigeria Ltd. in its deep test well at Ituk Mbang in the Calabar province of the eastern region of Nigeria. It is still too early to say whether or not there is oil in commercial quantities, but the preliminary results are encouraging. Further testing is being carried out.

This is the second time that an oil show has been encountered in Nigeria. In November last year another well at Akata, also in the Calabar province, proved the existence of some oil deposits. Further test wells are to be drilled to prove these deposits, and a second well has been spudded in at Akata.

Inhibited Transformer Oil

After several years of research and practical application, Shell-Mex and B.P. Ltd. has developed a selectively refined mineral oil and a compatible oxidation inhibitor for use in transformers. A number of users have had transformers in service with this oil for over four years without attention and without any development of acidity or sludge.

Transformer oils to B.S.S. are usually resistant to oxidation, but where oxidizing conditions are severe, acidity and sludge have formed. When this inhibited oil has been used, however, even in presence of the original uninhibited oil, oxidation has been stopped.

Stanvac India

Cammell Laird & Co. launched the 26,500 dwt tanker "Stanvac India," built to the order of Standard-Vacuum Transportation Co. Ltd., from its Birkenhead yard on August 17. The launching took place in the presence of representatives of the British and Indian governments and members of the international petroleum and transport industries, the ceremony being performed by Mrs. H. W. McCobb, wife of H. W. McCobb, vice president and director of Standard-Vacuum Oil Co. The tanker is 628 feet in overall length with a beam of 82 feet 5 inches, a draft of 32 feet and a speed of 17 knots.

Other August launchings include the "Vassiliki," built by Furness Shipbuilding Co. at Haverton Hill for the Nueva Vista Compania Naviera S.A. of Panama, and three ships to join the fleets of companies associated with Anglo-Iranian. One of these is the 32,000-ton "British Sovereign," launched at the Barrow yards of Vickers-Armstrong Ltd. on August 31 and sponsored by Lady Munro, wife of Sir Gordon Munro, director of Anglo-Iranian. The "British Patrol," of 16,500 dwt, was launched from the Newcastle-on-Tyne yard of Swan, Hunter and Wigham Richardson, the sponsoring ceremony being performed by Mrs. C. A. P. Southwell, wife of the managing director of Kuwait Oil Co. Ltd. On August 31 the "Border Minstrel," a 16,000-ton tanker built by Blythswood Ltd. for the Lowland Tanker Co., was launched by Lady Bruce, wife of Rt. Hon. Viscount Bruce of Melbourne.

Shell-Mex and B.P. Ltd. is augmenting its fleet of estuarial and river craft for service in British waters. Ten such vessels have been or will be ordered from British builders for completion in 1955-56. They will be employed in distributing petroleum products from the six United Kingdom refineries of Shell and Anglo-Iranian, and will be dovetailed into the main distribution system of Shell-Mex and B.P. Ltd.

The vessels will be diesel-engined and built to Lloyd's requirements. They will be fitted with modern radar equipment where desirable, such vessels having telescopic masts of special design. The cargo pumps and pipe lines installed will ensure the effective segregation of the products to be carried.

Nine of the new vessels will have the Voith Schneider propeller as the means of propulsion. With vertical blades and aerofoil section rotating around a vertical axis, the propeller will make it possible for the vessels to dispense with rudder, stern frame and ordinary steering mechanisms. The ships will have greater maneuverability than with the ordinary screw propeller, a factor of great importance in the trade in which they will be employed.

F. A. Keeling

Personnel

J. W. Campbell, chief accountant and assistant secretary of Stewarts and Lloyds Ltd., has been released by the company in order that he may continue as financial advisor to the Iron and Steel Agency to which his services were loaned in 1951. W. L. Jollie, chief accountant and assistant secretary of Stanton Ironworks Co. Ltd., will succeed to Mr. Campbell's position.

F. A. Keeling has been appointed director, finance, of Shell-Mex and B.P. Ltd. This is a new post and replaces Mr. Keeling's former position of comptroller of accounts.

J. H. Buscombe, of the finance administration of Shell Petroleum Co. Ltd., will shortly be joining Shell-Mex and B.P. Ltd. to take up an appointment as general manager of finance and accounts.

J. A. Pope, professor of engineering and dean of the faculty of Applied Science of the University of Nottingham, is on a visit to the Cardon refinery and the oilfields and installations of Cia. Shell de Venezuela in South America. Shell Petroleum Co. Ltd. and its associate, Shell Refining and Marketing Co. Ltd., are co-operating with the engineering department of Nottingham University in a newly developed scheme for the training of engineers, whereby potential graduates have one year in industry after leaving school, followed by three years at the university, and then a final year in industry to complete practical training.

J. A. Pope

Pipe Lines in Western Australia

By the end of 1954, the Kwinana refinery in Western Australia, built by Australasian Petroleum Refinery Ltd., associate of Anglo-Iranian, will be connected with the port of Freemantle by two high pressure product pipe lines. One 12-inch diameter line, 15 miles long, will carry fuel oil to ships' bunkering installations in Freemantle harbor and the other, a 6-inch diameter line, 17 miles long, will cross the Swan River and terminate at a distribution depot. This line will carry white products for distribution throughout Western Australia.

The 12-inch fuel line will be fed by two steam driven duplex double-acting ram-pumps and has a designed capacity of 400,000 tons per annum. The six-inch white oil line will be fed by motor driven centrifugal pumps and has a designed capacity of 550,000 tons of fuel per annum.

Study of Pest Control

Chemicals made from petroleum are playing more and more important roles in pest control.

Aldrin and dieldrin, chlorinated derivatives of cyclo-pentadiene, were originally developed in the United States, but a factory is now being built by Shell for their production at Rotterdam and is scheduled for operation at the end of this year. Meanwhile, a world-wide program for the testing and development of these insecticides is being carried out by the Shell organization with interesting results.

A lacquer has been developed containing these two insecticides, which has the unique property of expelling the insecticides in tiny invisible crystals, an action which is quickened by the friction of the insects crawling on the surface. Despite scrubbing and washing, the tonic strength of this lacquer is maintained for at least two years after application.

Applying Aldrex 30 as a spray against soil pests such as wireworms and leather jackets. Shell photo.

The formula for the lacquer is as follows:

Urea Resin (Type B.C. 555)	—50	parts by weight
Alkyd Resin (Type B.C. 666)	—50	" " "
Butanol	—27.5	" " "
Xylol	—22.5	" " "
Dieldrin	—12	" " "
Aldrin	—12	" " "

An accelerator (sulfuric acid 10 percent vol.) is finally added to the above in the proportion of 1:20. It is applied by spraying in places likely to harbor pests.

Aldrin has been most successful in control of locusts and grasshoppers in such countries as Iraq, Iran, Jordan, India and Pakistan. It has also given good results in the control of soil pests. Due to its volatility, it has only brief persistency when applied to the surface, but when used at a depth of 3-6 inches, it remains effective for periods of a year and upward. It does not taint crops or affect seed germination and is not lethal to earth worms. Dieldrin controls many insect pests, including mosquitoes, houseflies, fleas, ticks, cockroaches, bed bugs and amarim bugs, all of which are disease carriers, and because of its low vapor pressure it maintains its efficiency over long periods.

Stanvac Tanker Launched

A third oil carrier of the 26,500-ton supertanker class was launched in August for the Standard-Vacuum Oil Company fleet at the shipyards of Cammell Laird & Co. Ltd., near Liverpool, England.

The "Stanvac India," first United Kingdom vessel contracted by the company in the postwar period, will join the 50 owned and chartered tankers of the Stanvac fleet after sea trials are completed this fall. Two sister ships, "Stanvac Japan" and "Stanvac South Africa," built in Japan, already are in service. A fourth tanker of the same class will be launched in Great Britain early in 1955. The vessels are registered under the ownership of Standard-Vacuum Transportation Company Ltd. London.

Exchange of Processes and Designs

Two prominent British companies, Costain-John Brown Ltd. and Petroleum Development Ltd., have entered into an arrangement with Friedrich Uhde, GmbH, well-known chemical plant designers and engineers, for the mutual use and exchange of processes and process designs, especially in the field of nitrogen and petrochemicals. The full range of these processes and designs, together with the plants embodied in them, will thus be available throughout the British commonwealth.

Bitumen Plant at Hamburg

Anglo-Iranian Oil Co. announces that various grades of bitumen required by the German market are now being made at the newly commissioned bitumen plant in Hamburg. The plant has a capacity of 50,000 tons of bitumen per year, using as feedstock the residual oil from the vacuum distillation unit commissioned earlier in the year. The bitumen will be distributed in road and rail tankers, and also in drums, blocks and sacks.

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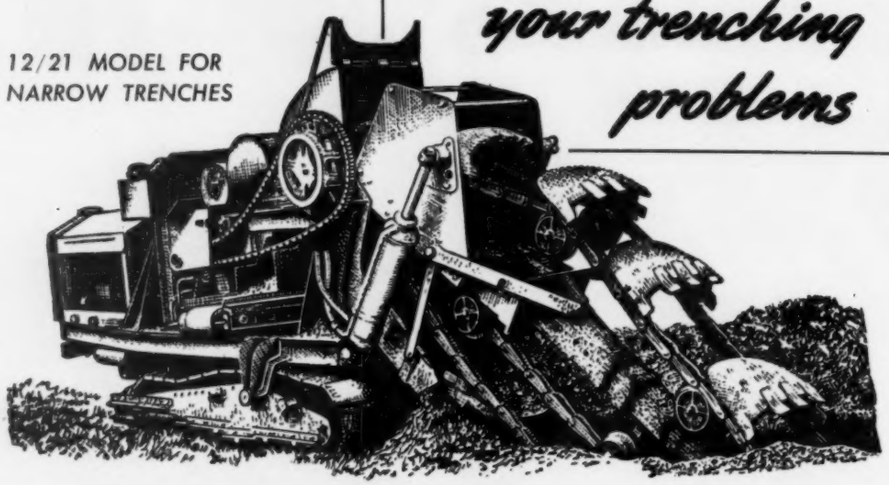

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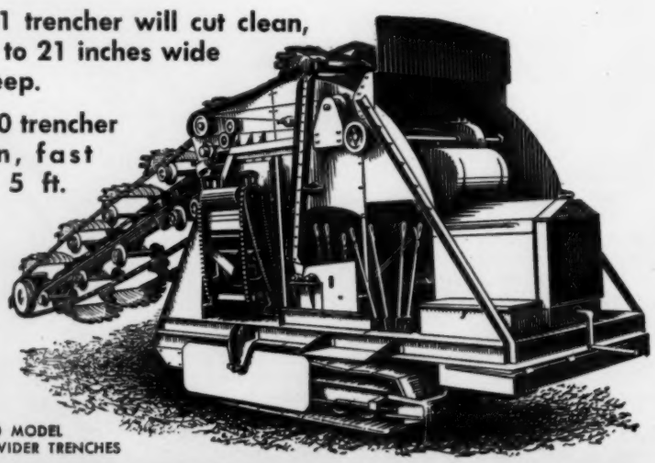
The Model 16/60 trencher will cut clean, fast trenches up to 5 ft. wide down to 14 ft. deep.



Illustrated catalogues sent on request.

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INTERNATIONAL NEWS AND NOTES

Soviet Interests Expand

According to a recent article in *Die Presse*, a new survey of Austria's oil fields discloses that the share of oil companies not controlled by the Soviets decreased from 40 percent in 1947 to six percent in 1953. These companies have become almost insignificant, although they receive an annual 70 to 80 million schillings ($2,700,000 to $3,077,000) in subsidies from Austrian government funds. The reason why these companies are receiving such a sum is that they are obliged to sell their products to the Soviet Oil Administration at prices below production costs.

Of the seven Austrian oil refineries with a total capacity of 1.9 million tons of crude oil, five belong to the Soviets, and two to Shell and Socony-Vacuum. The five Soviet plants are: Schwechart (360,000 tons), Korneuburg (330,000 tons), Lobau (330,000 tons), Moosbierbaum (290,000 tons), and an unspecified refinery.

Increased Austrian Gasoline Consumption

Austrian gasoline consumption in 1953 increased some 10,000 tons over 1952, to reach 160,822 tons, and diesel oil sales climbed to 188,865 tons, compared to 167,000 tons in 1952. The increased receipts from the gasoline tax, which this year are expected to reach about 500,000,000 schillings ($19,230,770), have permitted an expenditure of 394,000,000 schillings on the construction and repair of Federal highways so far, compared to 320,000,000 spent last year in all 12 months. Trade Minister Illig promises that 500,000,000 will be spent in all, the highest amount ever earmarked for this purpose in the First or Second Austrian Republic. Since car imports from non-EPU countries are also intended to be liberalized eventually, the Minister stated that the thereby expected surplus in revenues from the mineral oil taxation might increase the annual capital to some billion schillings, which would suffice to expand and repair the entire Federal road system.

Extension of Natural Gas Network

Bucharest, Romania has extended its natural gas pipe line. Additions in 1953 replaced consumption of about 400,000 metric tons of firewood and 38,000 metric tons of liquid fuel. Nearby villages are also installing methane gas lines, particularly for heating municipal buildings.

Search in Upper Austria

The discovery of oil deposits in neighboring Bavaria has strengthened hopes that the Upper Austrian soil also contains oil. Natural gas deposits in the Wells Basin and methane traces in the Bad Hall area have added more weight to these hopes. It will need deep drilling, however, to ascertain the existence of oil in Upper Austria.

Shell Makes Change in Colombia

Cia. de Petroleo Shell de Colombia announced the transfer of all its Colombian operations to Shell Colombia S. A. effective September 1. This new company will handle the sale and distribution of all Shell products throughout Colombia.

Hungary Reclaims Lubes

Hungary is pushing a drive for the collection of used lube oil, and is at present averaging 25 railroad cars of reclaimed oil per month, for issuance along with regularly processed lubricants.

Czechs Sell Austrian Oil to Germany

In May, the SMOA exported to Czechoslovakia some 23,500 tons of petroleum, 16,000 of gas oil, 3,000 of gasoline, and 50 tons of kerosine, valued at 30.85 million schillings ($1,186,540). Czechoslovakia frequently re-exports Austrian oil to the West, labeled as a Czech product. In 1953 the Soviets processed 50 percent of total production in Austria, and exported the remaining 50 percent as crude oil, causing Austria a loss in foreign exchange of about 800 million schillings through these exports.

Czechs have now established contact with a Swiss businessman who will buy Austrian oil from Czechoslovakia and ship it to West Germany in exchange for copper.

Protection of Oil Extraction Pumps Against Corrosion

The Romanian Technicians & Engineers Association has been studying the problem of extending the production period of oil wells between overhauls by preventing pump corrosion. A cathode pump protection system tried out at 16 oil wells at Moreni, Gura Ocnitei, Ochiuri, and Filipestii de Padure has extended the operating period from 24 to 82 days. In the Boldesti field, inhibitors reduced salt water corrosion on the pumps, and extended the operating cycle from four or five to 20 days.

Iraq to Build Lube Plant

The government of Iraq, through Sayid Ihsan Rifaat, head of its technical organization, has invited international firms to submit bids for construction of a lubricating oil plant to be operated in connection with its Baghdad refinery. The unit is to be of 25,000 tons yearly capacity, is to be located on the western bank of the Tigris at Dora near Baghdad, and is to be constructed in accordance with plans of the technical commission for completion before the end of 1955.

High Quality Oilfield Equipment

The SOVROM-UTILAJ Petrolifer Works of Targoviste has turned out a new product, the rotary drilling aggregate AVB 3-100, designed and constructed in accordance with Soviet documentation, to facilitate geological exploration of oil deposits.

Aid to Romania Acknowledged

Romanian crude oil reserves have been doubled in the past five years, according to a recent address by Ion Dumitru, petroleum minister. More than 70 percent of the current output is from new fields or deeper horizons in old fields. Half of current drilling is exploratory as compared with 13 percent under private ownership, Mr. Dumitru said.

The minister described technical assistance given by Soviet engineers. This includes formation fracturing, gas repressuring, water flooding, paraffin removal by electrical means, instrumentation for measuring deviation in bore holes and mechanized drilling and transport equipment.

Recent press reports credit drilling with clear water as being responsible for much faster drilling rates than were possible when mud was used.

Expands Oil Search in Australia

Anglo-Iranian Oil Co. has increased its interest in the oil search in Australia by participating through its prospecting subsidiary, D'Arcy Exploration Co., in a new company, Frome Lakes Pty. Ltd., which plans a vigorous exploration and drilling program in Southeast Victoria.

Frome Lakes Pty. Ltd., has been formed by Frome-Broken Hill Pty. Ltd. (in which the D'Arcy company and subsidiaries of the Consolidated Zinc Corp. and Standard Vacuum Oil Co. are shareholders) and Lakes Oil Ltd., and the Austral Oil Drilling Syndicate.

Anglo-Iranian has been concerned since 1946 (through the D'Arcy company) in Frome-Broken Hill's extensive exploration for oil and gas in wide areas of Australia.

Technical Advice Contract

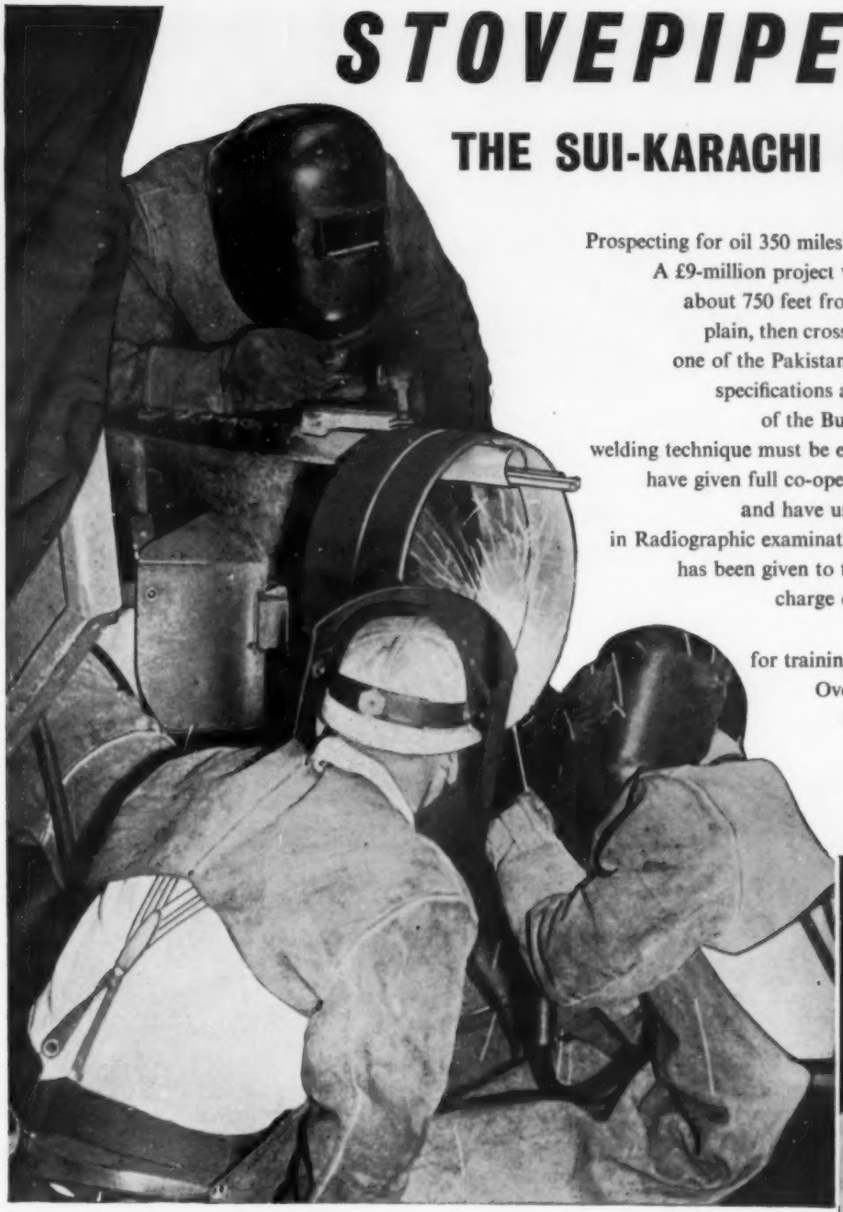
The Philippine Oil Development Co. has concluded a basic agreement with American Overseas Petroleum Ltd. for technical advice and direction in the company's explorations for oil in its Philippine concessions. The announcement was made last week by Col. Andres Soriano, company president.

American Overseas Petroleum, with head offices in New York, was the organization which provided the technical advice and direction which resulted in the first commercial discovery of oil in Australia. It is one of the Caltex companies.

The "Caltex Manila" delivering first cargo to the refinery of Caltex (Philippines) Inc. at Batangas in the Philippine Islands. The refinery will be formally opened in December.

STOVEPIPE WELDING

THE SUI-KARACHI GAS TRANSMISSION LINE



Prospecting for oil 350 miles from Karachi, the Burmah Oil Co. discovered natural gas. A £9-million project will transmit this through 350-miles of 16" pipe, descending about 750 feet from the Sui range, traversing desert and the irrigated Sukkur plain, then crossing the River Indus. Messrs. D. & C. and Wm. Press Ltd., one of the Pakistan construction group contractors, are working to strict rigid specifications as laid down by the Sui-Gas Transmission Co., a subsidiary of the Burmah Oil Co., who stipulate that the stovepipe (downhand) welding technique must be employed entirely. For the past few months both companies have given full co-operation in an extensive training programme in this technique and have used the Lincoln welding school facilities. Advanced training in Radiographic examination and interpretation, and in the application of stovepiping has been given to the five Sui-Gas Transmission Co. inspectors who will be in charge of this welded project. Following this, Messrs. D. & C. and Wm. Press sent all their welding operators to the school for training and testing in this method to API-ASME code standards. Over 60% of these men have achieved Grade A qualifications. Lincoln SAE 300 Diesel Welders, with Lincoln Fleetweld 5 and Shield-Arc 85 Electrodes, are being used exclusively on this 350 mile gas line.

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World Production Off 218,200 Barrels in Third Quarter

World production of crude petroleum decreased 218,200 barrels daily in the third quarter to 13,427,900 b/d, according to estimates gathered by WORLD PETROLEUM. Average for the quarter is about the same as in the first three months of the year, but exceeds the average for 1953 by 357,000 b/d.

United States output was 316,000 b/d below the second quarter as the industry sought to halt inventory accumulations resulting from the unsatisfactory rate of increase in domestic demand and the 15 percent drop in exports. First half domestic production of all oil averaged 7,128,000 b/d compared with 7,165,000 b/d a year ago. Domestic demand averaged 7,747,000 compared with 7,701,000 b/d in the first half of 1953.

Outside the United States, crude production increased 96,200 b/d in the second quarter. This was a rise of 1.3 percent compared with the first quarter. Largest increases were in Canada and the Middle East. Better consuming demand and pipe line fill requirements permitted Canadian producers to jump their output to 289,000 b/d, an increase of 65,000 b/d over the low second quarter when a substantial number of refineries were closed for inspection and repairs.

In the Middle East, Kuwait production jumped to 965,500 b/d from 919,500 b/d in the June quarter and Iraq rose another 18,000 to 640,500 b/d. Saudi Arabian production fell 33,000 b/d to 945,500 b/d. Changes in other areas were of minor importance.

WORLD CRUDE OIL PRODUCTION
(Thousands of Barrels Daily)

	1954 Third Quarter	1954 Second Quarter	1954 First Quarter	1953
NORTH AMERICA				
United States	6,212.0	6,528.5	6,375.2	6,466.6
Canada	289.0	223.9	243.5	220.9
Mexico	230.0	225.0	218.3	200.5
TOTAL	6,731.0	6,977.4	6,837.0	6,888.0
SOUTH AMERICA				
Venezuela	1,829.0	1,848.7	1,896.4	1,764.7
Colombia	114.0	113.4	114.6	107.8
Argentina	78.0	78.3	82.4	78.0
Trinidad	64.0	64.0	63.1	61.2
Peru	47.0	47.4	46.6	45.2
Equador	8.4	8.4	8.4	8.1
Bolivia	4.5	4.5	4.5	2.2
Cuba	0.1	0.1	0.1	0.1
Brazil	2.2	2.2	2.1	2.6
Chile	4.6	4.6	4.5	3.5
TOTAL	2,151.8	2,171.6	2,222.7	2,073.4
WESTERN HEMISPHERE	8,882.8	9,149.0	9,059.7	8,961.4
EUROPE & AFRICA				
Austria	60.0	62.0	60.0	60.0
Germany	52.0	51.0	48.0	42.2
Netherlands	18.0	18.0	17.1	15.6
Hungary	14.0	14.0	14.0	14.0
France	9.0	8.2	7.1	7.1
Yugoslavia	3.0	3.0	3.0	3.0
Algeria	1.7	1.7	1.7	2.0
French Morocco	2.1	2.1	2.1	2.1
Italy	2.7	2.0	2.0	1.8
United Kingdom	1.1	1.1	1.1	1.1
TOTAL EUROPE EXC. USSR & SAT.	163.6	163.1	156.1	148.9
USSR	1,113.5	1,130.0	1,095.0	1,040.0
Romania	120.0	120.0	110.0	105.0
Poland	4.0	4.0	4.0	4.0
Albania	3.0	3.0	3.0	3.0
Czechoslovakia	2.5	2.5	2.5	2.5
TOTAL USSR & SAT.	1,264.5	1,259.5	1,214.5	1,154.5
TOTAL EUROPE	1,428.1	1,422.6	1,370.6	1,303.4
NEAR & MIDDLE EAST				
Saudi Arabia	945.5	978.8	951.3	845.0
Kuwait	965.4	919.5	891.8	842.2
Iraq	640.5	622.1	593.0	574.4
Qatar	101.0	101.0	96.8	84.8
Egypt	36.0	37.3	34.3	45.2
Bahrain	30.0	30.0	30.0	30.1
Iran	35.0	39.6	42.7	25.5
Neutral Zone	30.0	12.4	7.0	—
Turkey	0.6	0.6	0.6	0.5
TOTAL	2,784.0	2,741.3	2,647.5	2,467.7
FAR EAST & OCEANIA				
Indonesia	199.0	198.9	205.0	209.1
British Borneo	98.0	98.9	101.0	101.0
Japan	6.0	6.0	6.1	5.8
India	7.0	7.0	7.0	6.5
New Guinea	13.1	12.5	6.0	4.8
Pakistan	4.4	4.4	4.4	4.4
Burma	3.0	3.0	3.0	2.5
China	2.5	2.5	2.5	2.0
TOTAL	333.0	333.2	335.0	336.1
EAST. HEMISPHERE	4,545.1	4,497.1	4,353.1	4,107.2
WORLD TOTAL	13,427.9	13,646.1	13,412.8	13,068.6

Cuban American Petroleum Corporation

Cuban American Petroleum Corporation, organized by Latin American and United States capital, is preparing to undertake oil exploration in Cuba. Dr. Octavio Reyes Espindola, former Mexican ambassador to Cuba, is president; Eduardo Grenas, a Colombian oil man, is vice president; and Joseph W. Frazer, chairman of the Graham-Paige Corporation, is chairman of the board. The company intends to begin drilling shortly in the central district of the island in the general region of the recent discovery well, Echeveria No. 1.

Albanian Exports

Albanian crude production recently has been somewhat greater than refining capacity. A tanker load of some 50,000 barrels recently was shipped to West Germany.

Shale Gas Plant

An Esthonian gas factory near Narwa, using slate of high oil content as raw material, is producing an estimated million cubic meters of gas per day. A 10-inch pipe line has been laid to supply Leningrad.

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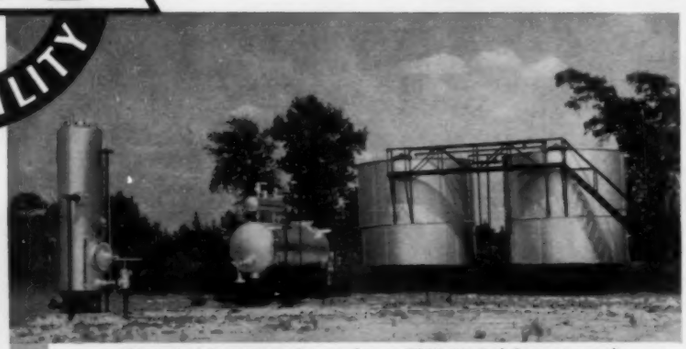
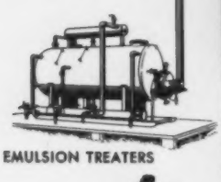
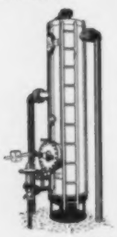


This typical lease operation employs a BS&B Vertical Separator and a BS&B Horizontal Emulsion Treater—both equipped with BS&B "Climax" Automatic Controls. The two 500 bbl. Bolted Steel Tanks and the "Safwalk" Steel Stairway and Walkway are also BS&B.

HEATERS



EMULSION TREATERS



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This leadership has been born of our never-ending effort to improve on the "established" ways of doing things, and of our continuing program of engineering research, pioneering and the development of equipment which outperforms all others—with faster payout and greater profit for you!

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OIL COMPANY STAFF CHANGES

D. J. SMITH was elected president of The American Oil Co. at the first meeting of the board of directors following the reorganization attendant on absorption of Pan American Petroleum and Transport Co. by Standard Oil Co. (Ind.). Robert E. Wilson of Standard was named chairman of the board.

As a result of the reorganization, the company will become fully integrated. It will operate refineries at Baltimore, Md., and Savannah, Ga., as well as the new 35,000 b/d refinery now building near Yorktown, Va. The company will continue to market the output of the Texas City refinery operated by its subsidiary, Pan American Refining Corp. The company's crude oil production, gas production and pipe line facilities will be operated by other subsidiaries, Pan American Production Co., Pan American Gas Co., Pan American Pipe Line Co. and Fairfax Pipe Line Co.

Through the reorganization, The American Oil Co. becomes wholly-owned by Standard Oil Co. (Ind.). Pan American Petroleum & Transport Co., former parent of the group of companies now headed by American, has been merged into Standard.

Affiliated companies which are to be dissolved and their business taken over by American as a part of the overall reorganization plan include: Pan American Refining Corp. of Delaware, Mexican Petroleum Corp., Mexican Petroleum Corp. of Georgia, Lord Baltimore Filling Stations, Inc., and May Fuel Oil Corp.

Other officers include: L. W. Moore, executive vice president; J. A. Carroll, Jr., financial vice president; R. M. Nash, vice president and general counsel; H. C. Smith, A. A. Corona, J. P. Patterson, T. A. Aldrige, H. R. Snow, J. J. Leu and M. L. Schwartz, vice presidents; F. X. Mannix, secretary; R. A. Arzinger, treasurer; and W. M. Scott, comptroller.

EDWARD F. MORRILL of Longview, Texas, has been appointed general manager of the new petrochemical division of The Standard Oil Co. (Ohio). He has been president of the Mid-Valley Pipeline Co. since August 1950. F. Hill Sanders, vice president and director of Sun Pipe Line Co. and general manager of its crude pipe lines department, is expected to be elected Mid-Valley's president, replacing Mr. Morrill.

In accepting the general management of the Sohio petrochemical division, Mr. Morrill will be responsible for the construction of Sohio's new $17 million manufacturing plant to be located in the Toledo-Lima, Ohio area. Engineering plans are now substantially complete, but several plant sites are still being considered. Construction of the plant, which will produce anhydrous ammonia, urea, nitrogen solutions and nitric acid, is expected to start in September and is scheduled for completion early in the fourth quarter of 1955. The Sohio plant will have a daily production capacity of 300 tons of anhydrous ammonia.

As president of Mid-Valley, Mr. Sanders will be responsible for the management of the 1,000-mile big inch crude oil pipe line system reaching from Longview, Texas to Lima, Ohio. The pipe line, representing a total investment of $62 million, was completed in 1950 with a capacity of approximately 150,000 barrels per day and was expanded in 1952 to 230,000 barrels per day capacity. The Sun Pipe Line Co. and Sohio are major stockholders of Mid-Valley.

ROBERT E. PORTER has been promoted to the newly-created position of chief pilot for Shell Oil Co. In his post in the company's aviation department, Mr. Porter will co-ordinate the operations of aircraft employed by Shell and its affiliates throughout the United States and Canada.

CONRAD J. BAUER, of Standard Oil Co. (N. J.), has been appointed assistant director of the Oil and Gas Division of the Department of the Interior, Secretary Douglas McKay announced.

Mr. Bauer will direct overall activities in the development and coordination of plans to assure a worldwide supply-demand balance for oil and gas and their products. He also will be responsible for effective functioning of the Foreign Petroleum Supply Committee, and will represent the United States on the petroleum planning committee of the North Atlantic Treaty Organization, and head up its working group. The post of assistant director is newly-created in the OGD.

Mr. Bauer has been head of the foreign petroleum economics section of the coordination and economics department of the Standard Oil Co. (N. J.) He has been in the company's employ for 35 years. In the recent defense emergency he was with the statistical committee of the Foreign Petroleum Supply Committee, under the Petroleum Administration for Defense. During World War II, he served as advisor to the committee on foreign supply of the Petroleum Administration for War.

He is a native of New York, and serves the government without compensation.

ROBERT L. ANDERSON, senior administrative geologist of Geophoto Services, Denver, has been appointed to the position of chief geologist. He is a graduate in geology of the University of California. Among his numerous field assignments with Geophoto was a year in Ethiopia. He is currently a vice president of the Rocky Mountain Association of Geologists.

Robert F. Thurrell, administrative geologist, is on leave of absence attached to the recently opened School of Natural Resources of the Pan American Institute of Geography and History in Rio de Janeiro. Mr. Thurrell's assignment is concerned with initiation of a training program in photogeology and photogrammetry. The school is attended by representatives of the 21 Latin American Republics.

DR. AHLBORN WHEELER, international authority on the chemistry of catalysis, has joined the research staff of Houdry Process Corp. As a member of the fundamental research division, he will study the catalytic activation of hydrogen.

Dr. Wheeler formerly worked for Shell Development Co., where, with the late Dr. Otto Beeck, he studied the catalytic properties of evaporated metal films. Since 1946 he has been with the polychemicals department of du Pont, studying catalytic hydrogenation and reaction rates in catalyst pores.

O. N. MILLER has been elected a vice president of Standard Oil Co. of California. He was general manager of the manufacturing department of Standard Oil Co. of Calif. His experience includes both the research and refining fields, including planning and design of the Ras Tanura refinery in Saudi Arabia. Before coming to San Francisco in 1946, Mr. Miller was superintendent of the cracking division at California Standard's El Segundo refinery in Southern California. He joined the company in 1934.

PETER L. RULE, Calgary architect, has been elected a director of Royalite Oil Company Ltd. He fills a vacancy on the board created by the recent resignation of K. M. Pringle of Toronto who has retired from active business.

C. J. Bauer

R. L. Anderson

Dr. A. Wheeler

O. N. Miller

REFINERY PROCESS NEWS

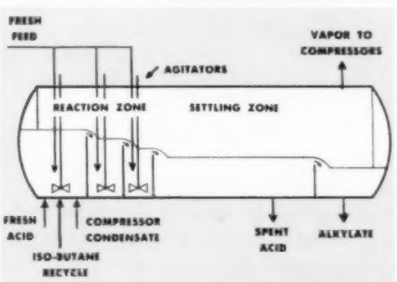
PUBLISHED BY REFINERY PROCESS DIVISION, THE M. W. KELLOGG COMPANY OCTOBER-NOVEMBER 1954

Special Kellogg Reactor Improves Quantity and Quality of Alkylate

Shown below is a simplified drawing of a typical Kellogg alkylation reactor, the principal feature of which is cascade flow of sulfuric acid catalyst and feed through a reaction zone consisting of three separate sections.

Briefly, in the Kellogg process, the isobutane-olefin feed is introduced into each of the three sections while isobutane recycle and fresh acid is introduced into the first section. During the reaction, which generally proceeds at a temperature between 38° and 40°F., the sulfuric acid drops in concentration due to dilution by moisture in the liquefied gas stream and side reactions with impurities in the feed. The acid is continuously withdrawn as it becomes spent, usually at a concentration of about 90%, though this may vary widely. Fresh acid is regularly introduced to keep the quantity and concentration in the reactor constant. The product of the reaction is passed through a caustic wash and then fractionated at higher temperatures.

One of the chief advantages of the Kellogg design stems from the fact that a 9-to-1 ratio of iso-



butane to butene is maintained in the reaction zones, although the actual ratio of isobutane to butene in the fresh feed plus recycle is only 4-to-1. Consequently, high quality alkylate is produced without adding to pumping and vessel costs in order to handle a large volume of isobutane which would otherwise be required to obtain this very desirable high concentration of the saturate in the reaction zones.

Another advantage is found in

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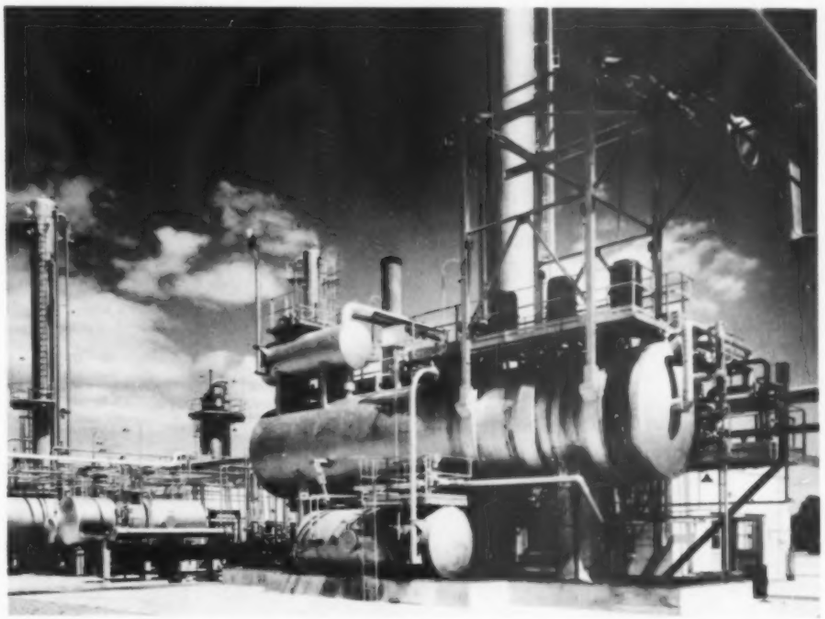

The alkylation half of a new cat poly-alkylation combination unit recently completed by Kellogg as part of a major modernization program at a Midwest refinery. The combination unit provides maximum utilization of the light ends from a new Orthoflow cat cracker.

Combining Both Alkylation and Polymerization for Light Ends Processing Shows Many Advantages

The economical upgrading of surplus light refinery gases to more valuable products has been a continuing refinery problem and one which has consequently come in for considerable attention in Kellogg's research and development activities. Out of these efforts have come numerous contributions to the fields of alkylation and polymerization—both of which are now standard processes for converting light hydrocarbons to high-octane, low vapor pressure gasoline components.

Since the feedstocks required for these two processes are supplied by the refinery gas stream, they have usually been considered competitive to some degree. Each, of course, must be analyzed in the light of the particular situation in question and the results to be achieved. But while some circumstances would seem to call for alkylation and others for polymerization, economic studies — which have been supported by a number of recent refinery installations — have shown that in many instances the two processes are complementary rather than competitive. And in those cases where alkylation and polymerization have been combined, the advantages of the resulting processing scheme have far exceeded what could be expected from individual installations of either process.

Low Cat Poly Conversion Improves Alkylation Feed

For example, in a typical alkylation-polymerization operation, the combined C-3 and C-4 stream can be passed first through the poly unit under low conversion conditions (using a lower temperature and a higher space velocity than under normal conversion operations) so that a quantity of unsaturates remain unconverted. These unsaturates are sufficient to alky-

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REFINERY PROCESS NEWS

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Advantages...

late all of the available refinery isobutane in the subsequent alkylation step. Moreover, the low conversion conditions selectively convert the propylene and isobutene (the latter an undesirable component for alkylation purposes) to polymer gasoline, and isomerize butene-1 to butene-2. The unreacted stream from the polymerization unit thus not only contains a good ratio of isobutane-butene, but the butene, being the "2" isomer, is most effective for alkylation feed.

Several advantages result from combining polymerization and alkylation in this manner. *First*, all refinery isobutane is converted to alkylate and upgraded in value to the maximum extent. *Second*, the refiner is able to further increase his gasoline production through vapor pressure blending with less volatile normal butane and *third*, less severe polymerization appreciably increases catalyst life, reducing operating costs.

(continued from previous page)

Special Reactor...

the cascade flow of acid and feed from the first section onward. Fresh acid, charged to the first section, flows through the other two sections before entering the hydrocarbon-acid settling portion of the reactor. Since the olefin-isobutane reaction is a very rapid one, it is completed in the reaction sections while the acid concentration is still relatively high. This also contributes to higher quality alkylate.

For further information, technical data, etc., on any refining process, write

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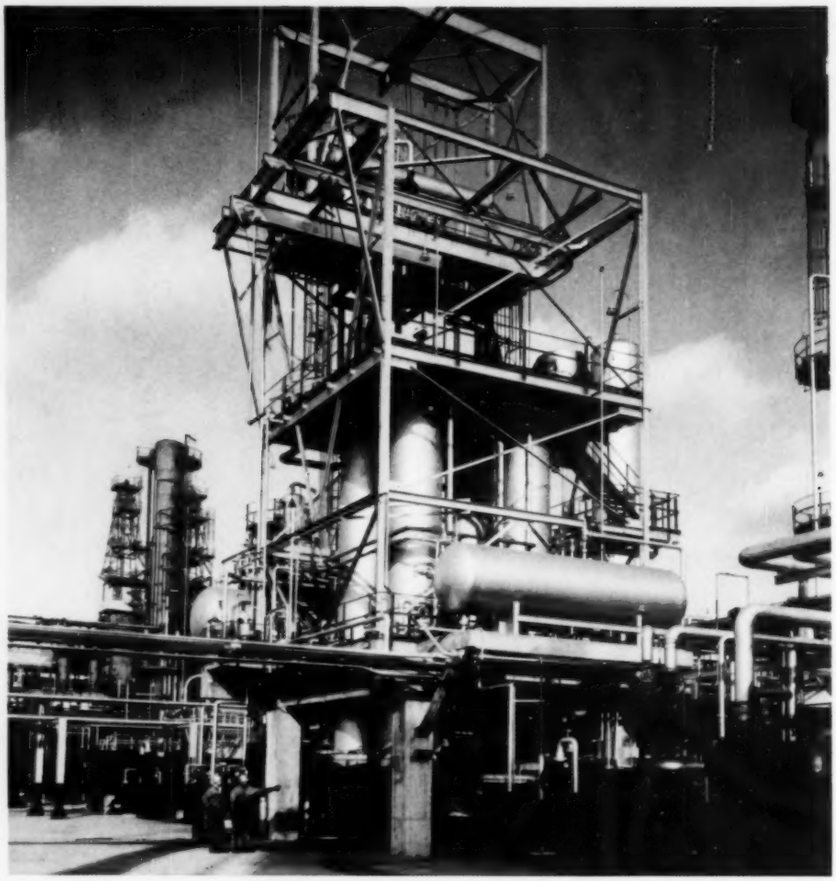

This is the new catalytic polymerization unit which is integrated with the alkylation unit pictured on the previous page and now operating at a Midwest refinery.

Kellogg Developments Reduce Cost of Catalytic Polymerization

As an original member of the Polyco Group, Kellogg has been intimately associated with the development of the cat poly process from its beginning.

In this process, polymerization of light, unsaturated hydrocarbons is accomplished in the presence of a catalyst under moderate temperature conditions (up to 500°F.) at pressures up to 2000 pounds. Under these conditions, the paraffin hydrocarbons in the stream are not converted to olefins. They consequently pass through the unit unchanged so that they are available for a subsequent alkylation step or for some other use. By the elimination of any cracking action in the process, the quality of the product can be closely controlled. Lower initial costs of installation and lower operating costs are also important factors in favor of catalytic polymerization.

Kellogg has contributed even further toward greatly reduced initial costs by building units, wherever possible, that utilize soaking drums from outmoded thermal cracking units. And in its continuing efforts to reduce daily operating costs, Kellogg has perfected a long-life catalyst that appreciably lengthens on-stream runs.

This catalyst, copper pyrophosphate, was developed in Kellogg's Jersey City, N. J. laboratories. Unlike other polymerization catalysts, which tend to agglomerate quickly under the pressures utilized in the process, the Kellogg catalyst retains its original pelleted form and resists softening to a high degree.

Process Adaptable for Other Products

In addition to polymerizing propylene and butylenes in the refinery gas stream to make high-octane blending gasolines, special feedstocks may be utilized in substantially the same equipment and with the same catalyst to produce other valuable products such as cumene from benzene and propylene,

9,896 small businessmen help us serve you well

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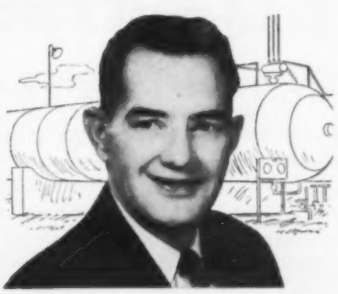
8,329 Independent Chevron Dealers like Jim Davenport, of Phoenix, Arizona, bring Standard's products to motorists.

725 Independent Distributors, like H. G. Hathaway, of Grants Pass, Oregon, distribute our products in rural areas.

188 Independent Marine Dealers like Ted Engstrom, of Olympia, Wash., retail Standard products to Western boatmen.

235 Independent Heating Oil Dealers like F. L. "Doc" Howard, Boise, Idaho, are retailers of Standard Heating Oils.

101 Independent Liquified Gas Dealers like Fred La Frentz, Cedar City, Utah, distribute butane and propane gases.



318 Independent Airport Dealers like Howard S. Fisher, San Diego, Calif., supply Standard products to Western planes.

Ever hear the one about big companies "squeezing out the little fellow"? You'd have a hard time convincing these 6 men—or the 9,890 independent businessmen like them who team with us to bring you Standard Oil Company of California products quickly, conveniently, economically. They form the nucleus of a distribution system that reaches every corner of the West. Each of these men operates his own independent company; together they employ 27,976 people. You probably know some of them because they contribute to the community life and prosperity of thousands of Western towns. Their undertakings are not only based upon Standard products, but operated and expanded with the help of scores of business aids Standard supplies without charge. We do all we can to help them prosper for Standard knows a big company can't succeed without the help of small businessmen. It takes both to serve you well.

STANDARD OIL COMPANY OF CALIFORNIA

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J. R. Cuthbert *J. S. Dalton* *C. R. Thompson* *F. G. Brown* *R. Elo*

J. R. CUTHBERT, manager of No. 1 refinery, Cleveland, has been appointed deputy assistant to the vice president of manufacturing of the Standard Oil Co. (Ohio). This position has been created to facilitate the coordination of administrative activities and the handling of special problems.

J. S. Dalton, general superintendent of No. 1 refinery, succeeded Mr. Cuthbert as manager of that plant and C. R. Thompson, assistant general superintendent of No. 1 refinery, became general superintendent.

F. G. Brown, manager of Latonia refinery of Sohio Petroleum, has been made consultant in refining until his normal retirement in June 1956. Ray Elo of Latonia will assume the managerial administration of the Lationia refinery as general superintendent.

HARVEY J. LOWE, manager of the eastern producing division of Pure Oil Co. for the past 22 years, has retired. He is succeeded by William M. Saxon, who has been manager of the Rocky Mountain division.

L. E. BARRETT, Ponca City, Okla., has been promoted to director of Continental Oil Company's employee benefits division, with headquarters in Houston, it is announced by John Post, manager of the company's industrial relations department. Formerly assistant director of the division, he succeeds C. E. Jester, who recently was appointed industrial relations manager for Conoco's southern region.

Winston J. Woellert, Houston, will succeed Mr. Barrett as assistant director of the employee benefits division.

HENRY HOFMANN has resigned as manager and secretary-treasurer of Tuscarora Pipe Line Co. Ltd. to become assistant to the president, a newly created position. Mr. Hofmann has been with Tuscarora for more than 35 years. He is succeeded by E. L. Ochs, another Tuscarora veteran with a quarter of a century of service to the company. G. Warren Miller has been named assistant secretary and treasurer. He has been assistant treasurer.

HILL SANDERS has resigned as vice president and general manager of Sun Pipe Line Co., crude lines department, to become president of Mid-Valley Pipe Line Co. with offices in Longview, Texas. He is succeeded by James E. Ford, formerly vice president and general manager of Sun Pipe Line's product lines department.

Charles Pinkner of Corpus Christi, Texas, formerly Sun Pipe Line superintendent for the southwest area, succeeds Mr. Ford as division superintendent of the product lines department. He will maintain offices in Philadelphia. Succeeding Mr. Pinkner at Corpus Christi is James Neill Fuquay, formerly assistant superintendent of Sun Pipe Line Company's crude line department.

E. J. McCLANAHAN has been named vice president and director of western operations by Standard Oil of California. He will have responsibility for operations of the company in the seven western states, Alaska and Hawaii.

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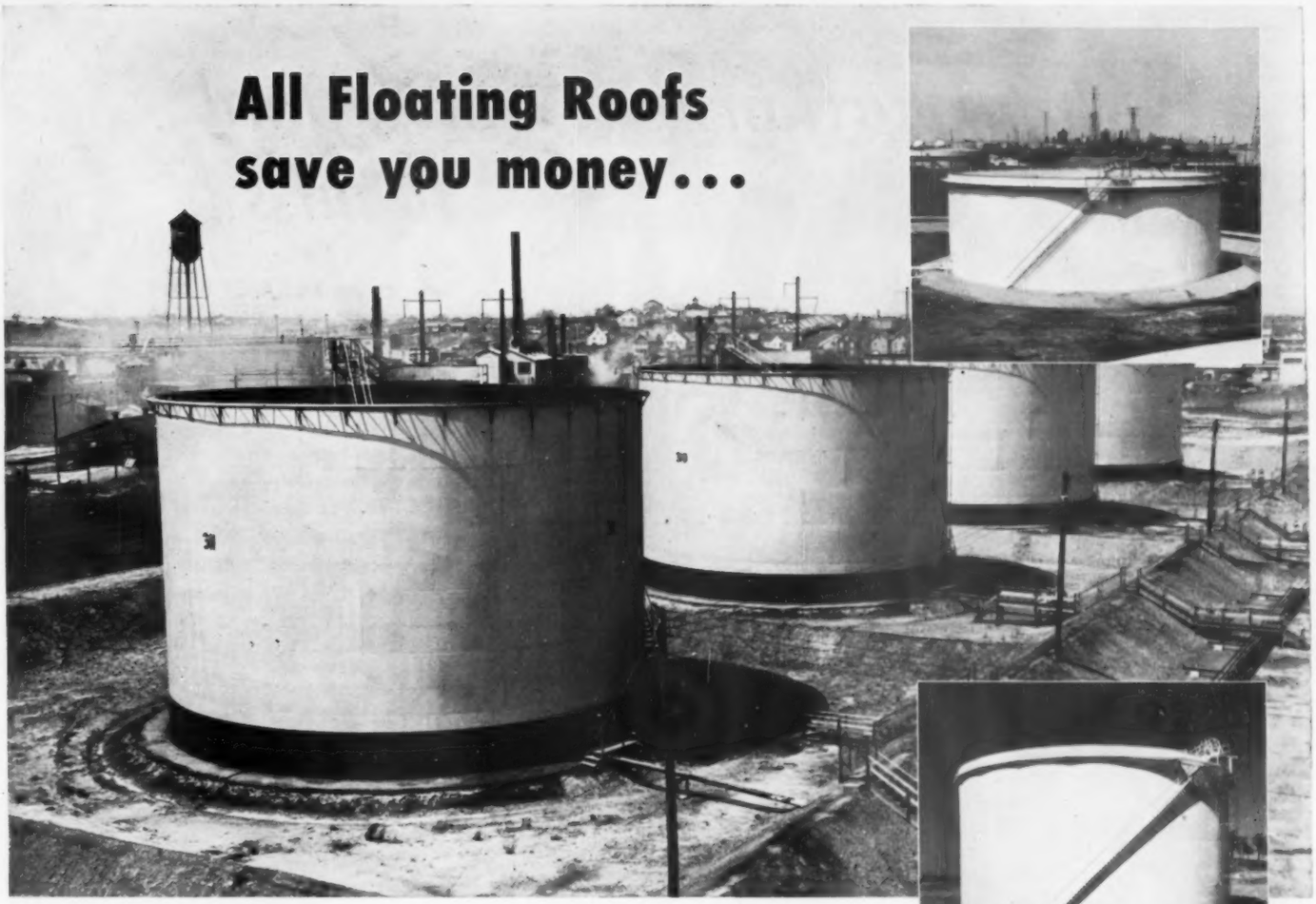

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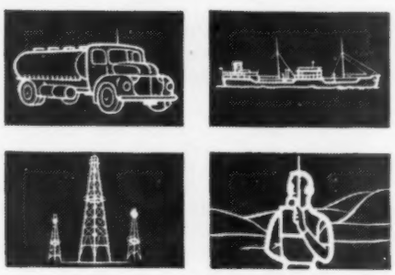

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Deilmann International Oil Operator

Carl Deilmann, who has long been active in oil development in Germany and who became internationally known by acquiring concessions and participations in Yemen (Arabia), Spain and Greece, recently celebrated his sixtieth birthday.

Mr. Deilmann was born in Dortmund, Westphalia. After completing his education and working for some time as a miner in order to gain practical experience, he joined his father's shaft building firm in 1923. Shortly thereafter, the company, which had been previously concerned with the coal industry, became interested in oil exploration, a field of activity that has become increasingly important in the company's operations.

In 1936 Mr. Deilmann became head of Carl Deilmann Bergbau GmbH, Bentheim, which was active in oil and gas development in the Emsland border district of Western Germany and gradually extended its operations to international fields.

Varel Forms Export Department

Formation of an export department, headed by Jack Thornton, has been announced by Daniel W. Varel, president of Varel Manufacturing Company of Dallas, manufacturer of rock bits and related oil field tools.

Due to the steady expansion of export shipments, the department has been established to assist all export representatives and oil companies.

Plans Oil History

Carl Coke Rister, author of *Oil! Titan of the Southwest,* which was published under sponsorship of the Standard Oil Co., N.J., will write a centennial history of the American oil industry for 1959 publication. Prof. Rister asks oil men to aid him by supplying data, maps and out-of-print books. He may be addressed at Texas Technological College, Lubbock, Texas.

Carl Deilmann

Joins Consultant Firm

Col. Philip I. Baker, structural engineer recently retired from Army Service, has joined Carrol E. Bradberry and Associates, Los Altos, Calif. He will head the structural division of the firm of consulting engineers which recently completed the engineering of pipe line and terminal facilities in the Kuwait-Saudi Arabia Neutral Zone for the American Independent Oil Co., San Francisco.

Stanwood Howes

Stanwood Hall Howes, Summit, N.J., died suddenly August 29 following a long illness. Mr. Howes joined Gulf Oil Corp. in March 1927, and served in Venezuela until 1950 as assistant engineer and chief oil dispatcher. From 1950 until his death he served as chief oil dispatcher of Gulf's foreign production division, in New York City.

George H. Taber

George H. Taber, Jr., retired oil company executive, died at his home in Rye, New York on August 20 at the age of 64, following a brief illness. Mr. Taber was long identified with the refining industry and was responsible for a number of improvements in refining processes including methods for stabilization of gasolines and utilization of waste gases.

After graduation from the University of Pennsylvania, he received an M.A. degree from Massachusetts Institute of Technology. His first employment was in the chemical industry, after which he joined the Gulf Refining Company. In 1917 he was appointed manager of Sinclair's gasoline division and rose through various executive posts to become president of The Sinclair Refining Company, a position which he held up to his retirement in 1948.

Roger Sherman

Roger H. Sherman, coordinator of oil producing activities of Standard Oil Co. (N. J.), died on September 5 at his home in Forest Hills, N.Y. at the age of fifty. Mr. Sherman graduated from the University of Colorado in 1926 with a degree in engineering. He entered the employ of Huesteca Petroleum Company in Mexico. He remained there until 1932 when he went to Creole Petroleum Corporation in Venezuela. For fourteen years he headed the exploration division of that company. In 1946 he was elected vice president of Creole and two years later he was drafted by the parent company, Standard Oil Co. (N. J.), where he had since been active in the production division.

Mr. Sherman was a director of Standard Oil Development Company and Arabian American Oil Company. He was a member of the Association of American Petroleum Geologists and of the American Institute of Mining and Metallurgical Engineers. He is survived by his wife, Mrs. Lucille Hoyns Sherman, his mother, Mrs. Jesse Sherman, and two sisters, Mrs. C. W. Hardwick and Mrs. Myron Platt.

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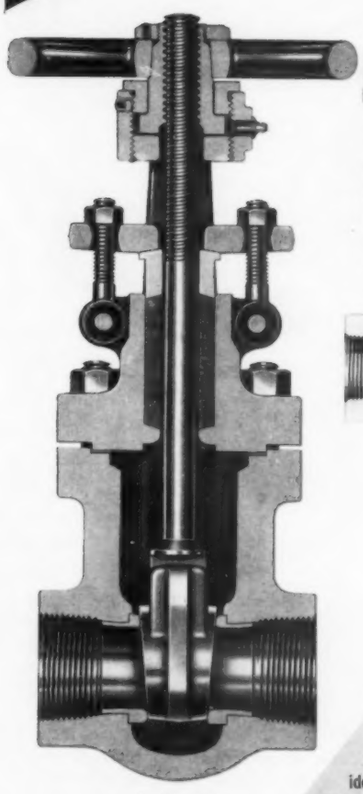

Fig. No. 3651

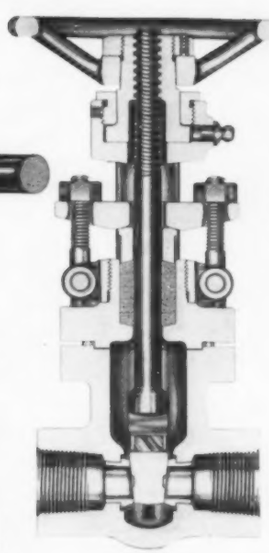

Fig. No. 595

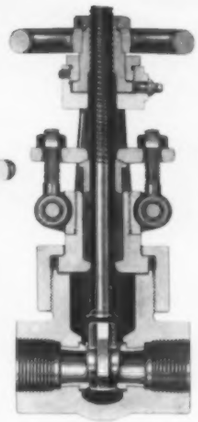

Fig. No. 55

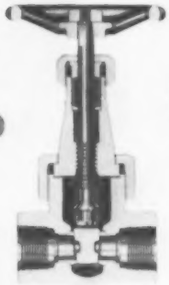

Fig. No. 65

Fig. No. 695

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Best personal regards.

Sincerely yours,

Hugo Riemer
President

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Sinclair to Build Udex Plant

Sinclair Chemicals, Inc., has begun construction of an aromatics producing plant at its Marcus Hook, Pa., refinery. The plant will produce 18,000,000 gallons per year of pure aromatic hydrocarbons including toluene, xylenes and paraxylene which will be supplied to the chemical and allied industries for the production of plastics, synthetic fibers, paints, medicinals and other chemical products.

Universal Oil Products Co. has licensed a Udex unit to process 2,300 barrels per day of selected catalytic gasoline fractions, and a contract has been awarded to the Badger Manufacturing Co. for the construction of the Udex unit as well as an installation to produce 10,000,000 pounds per year of paraxylene, a synthetic fiber raw material.

The feed stock for the entire petrochemical operation will be secured from Sinclair's new multi-million dollar catalytic reforming unit now being completed at its 100,000 b/d Marcus Hook, Pa., refinery.

Research Appointments

Howard J. Evans, former chief engineer of the Pittsburgh Equitable Meter division of Rockwell Manufacturing Co., has been promoted to chief engineer and manager of the central gas products research and development department. H. A. Altorfer, former chief engineer of the Nordstrom Valve division, Oakland, Calif., has been named chief engineer and manager of the central valve research and development department.

George H. Taber, Jr.

George H. Taber, Jr., 64, a former president of Sinclair Refining Co., died in New York on August 20 following a brief illness. Mr. Taber became manager of the gasoline department of Sinclair Oil & Gas Co. in 1917 and held various executive positions with the Sinclair organization before his retirement.

Shown above is half of the head for the fluid hydroforming unit reactor recently shipped by the M. W. Kellogg Co. to Standard Oil Co. of Indiana at Whiting. The completed reactor will be 135 feet high with an internal diameter of 23½ feet. Regenerator will be mounted above the reactor. Each half of the reactor head consists of four "orange peel" sections of carbon-moly steel plate 2¾ inches in thickness which were formed for Kellogg by Lukens Steel Co.

Book Review

Natural Gas in New Mexico, by Vicente Frevino Ximenes; published 1954 by Bureau of Business Research, University of New Mexico, Albuquerque; 73 pages.

The author gives an account of the state of the natural gas industry of New Market in relation to production price and sales and he uses his findings in support of recommendations that this resource be managed so that the local economy of the state shall receive greater benefits therefrom. His main proposition is that the state legislature enact oil and gas taxes that will keep at home more of the values that are now exported to other states.

Sunray Completes Delayed Coking Unit

The new 9,000 b/d delayed coking unit of Sunray Oil Company at Sunray Village near Duncan, Oklahoma went on stream early in September, according to an announcement by the company. Completion of the unit coincided with the opening of the 475-mile products pipe line from Sunray Village to a terminal on the Mississippi near Memphis.

In addition to the 360 tons per day of raw petroleum coke which the new plant will manufacture, it will also produce fuel gas, propane-propylene, butane-butylene, debutanized gasoline and gas oil for catalytic charging stock through the new installation. The coker gasoline and catalytic charging gas oil stock will be charged back into Sunray's catalytic cracking unit to produce up to 7,000 barrels per day of commercial fuel products including high quality gasoline, gas oil, butane and propane.

New Graver Flotation Unit

Graver Water Conditioning Co. has developed a new flotation unit, known as the Graver Aeroflotor. Besides handling floatable particles, the unit is capable, when necessary, of also removing settleable particles at the same time in the same unit. Since both types of particles are removed continuously, the unit can be especially advantageous where both heavy and light density are to be removed from the same liquid.

New Schlumberger Office

Schlumberger Well Surveying Corp. has recently established new district offices and a division maintenance center at Gretna, La. The Gretna district is under the supervision of Carl F. Schwab. Field units which formerly have been located at Harvey have been moved to the new center. The South Louisiana division of Schlumberger is under the direction of H. W. True.

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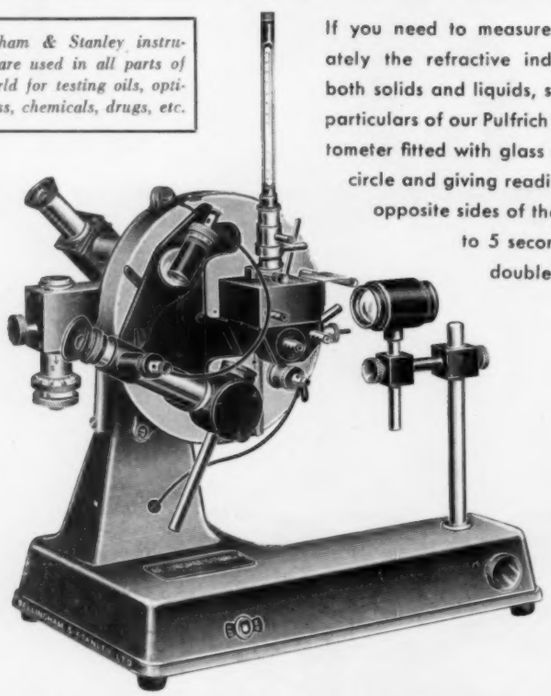

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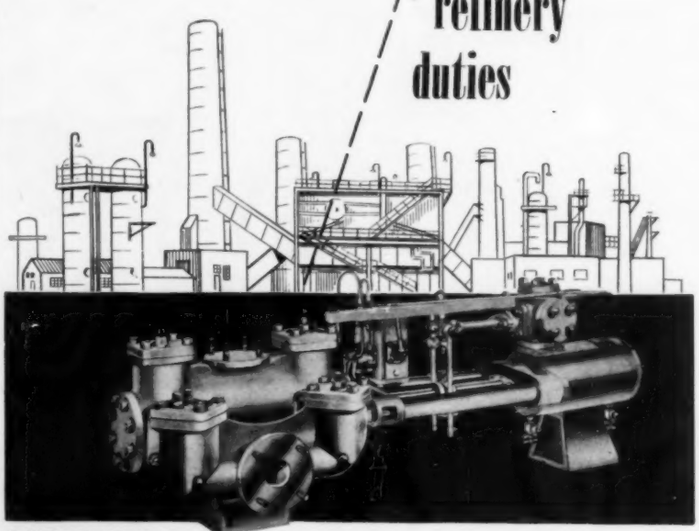

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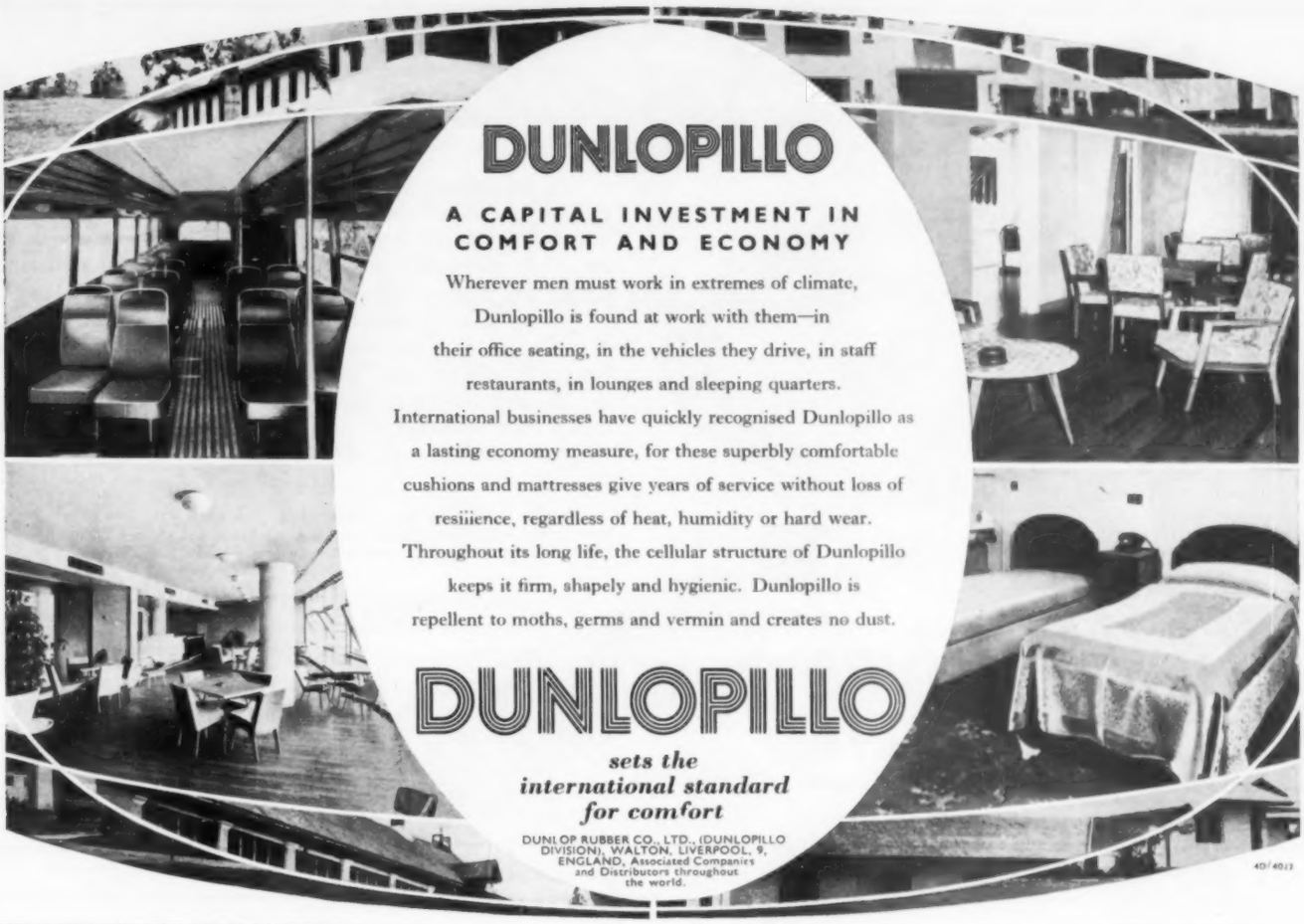

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Photograph by courtesy of Anglo-Iranian Oil Co. Ltd., showing the new 100,000 bbl. per day refinery at Aden under construction.

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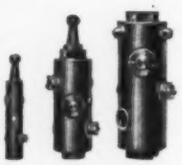

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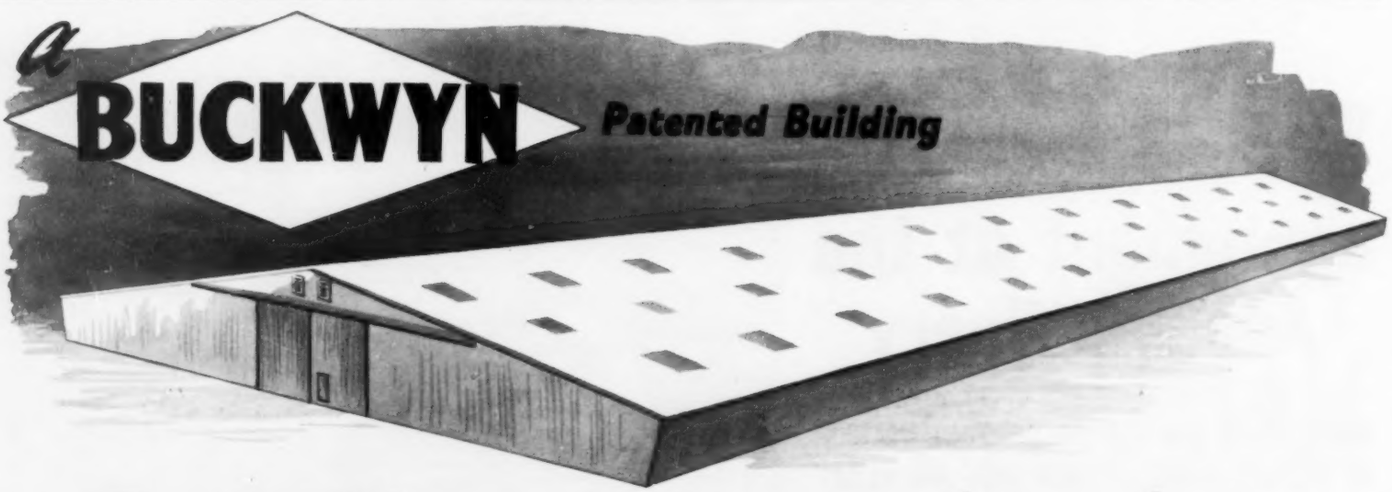

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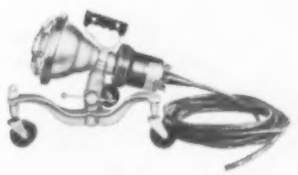

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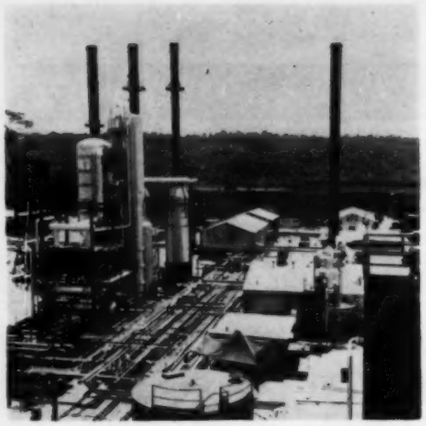
The "World Glory" is under charter to Gulf Oil Corp. for ocean service.

New Hammond Iron Works Catalog

Catalog 54B, the latest of Hammond Iron Works data books dealing with storage tanks and steel plate fabrication recommendations, accessories and fittings, computing tables for size and capacity, welding procedures, testing methods and information on all types of storage tanks and general steel plate construction has just been issued. Illustrated are examples of every type of storage tank designed and erected by Hammond. Copies are obtainable from Hammond plants or the general sales office at 630 Fifth Ave., New York City 20.

G. W. Hanneken

George W. Hanneken, former vice president and director of The Standard Oil Co. (Ohio), died August 17 at his home in Cleveland. Mr. Hanneken, born in Henry County, Missouri, August 5, 1881, started as a pipe fitter helper with the Standard Oil Co. of Kansas at its Neodesha Refinery in 1902. He joined Sohio in 1917 to help plan the new Sohio refinery to be built in Toledo and remained as superintendent of this refinery from 1919 until he was appointed general manager in charge of manufacturing for Sohio in 1936 and came to Cleveland. In 1939, he was elected vice president of Sohio and in 1940 became a director. He retired September 1, 1946.



The new $4 million refinery of American Bitumuls & Asphalt Co. near Cincinnati ranks among the largest in the world devoted exclusively to the production of asphaltic products. The plant covers 100 acres on the Ohio River. It will serve the Ohio, Kentucky, Indiana, and Michigan areas with paving asphalts, cutbacks, emulsified asphalt, and specialty products, each designed for specific types of construction work and maintenance.

Schlumberger Marine Office

A new service location far out in the Mississippi Delta has recently been established by Schlumberger Well Surveying Corp. Joe Williams is in charge of the new office.

Equipment assigned to the new district is entirely marine, consisting of motor vessels for inshore waterways and several offshore units for use on drilling platforms on open waters of the Gulf. The new location is designed to give more prompt service to over water drilling in the delta area.

Ultra-Sensitive Scintillation Counter

The Radiac Co., Inc., New York, has developed an ultra-sensitive scintillation survey meter for uranium and oil prospecting which it has named the "Ferret." It consists of a scintillation detector head and a count rate meter. The detector head uses an oversize gamma-sensitive crystal optically connected to the photomultiplier tube. The count rate meter has six ranges of sensitivity and four variable time constants. It can be used for fast, as well as slow, reconnaissance from a low-flying aircraft or moving vehicle. Weight, including batteries, is 53 pounds.

New High Alumina Catalyst

American Cyanamid Co. has developed a new high alumina fluid cracking catalyst for use in petroleum refining. The new catalyst has an alumina content of 25 percent by weight, contrasted with the 13 percent normally used in synthetic catalysts. Favorable results have been obtained from laboratory tests and a year of commercial application revealed a greater stability of catalytic activity, a 15 percent to 25 percent higher equilibrium activity, and in many cases, improved selectivity of end-product distribution. Stack losses were considerably lower.

H. S. Graver, Sr.

H. S. Graver, Sr., product manager for the bulk tank division of Graver Tank & Mfg. Co., Inc., East Chicago, Ind., died in Chicago after a heart attack on August 6. The last remaining son of the founder of the company, he had just completed 50 years of service.

Born in 1890 in Pittsburgh, where the company was founded nearly a century ago, he joined Graver at its East Chicago plant in 1904, immediately after graduating from the University of Michigan. He was a football star while at Michigan and was a member of coach Fielding Yost's famous team which played and defeated Stanford in the first Rose Bowl game on New Year's Day in 1902.

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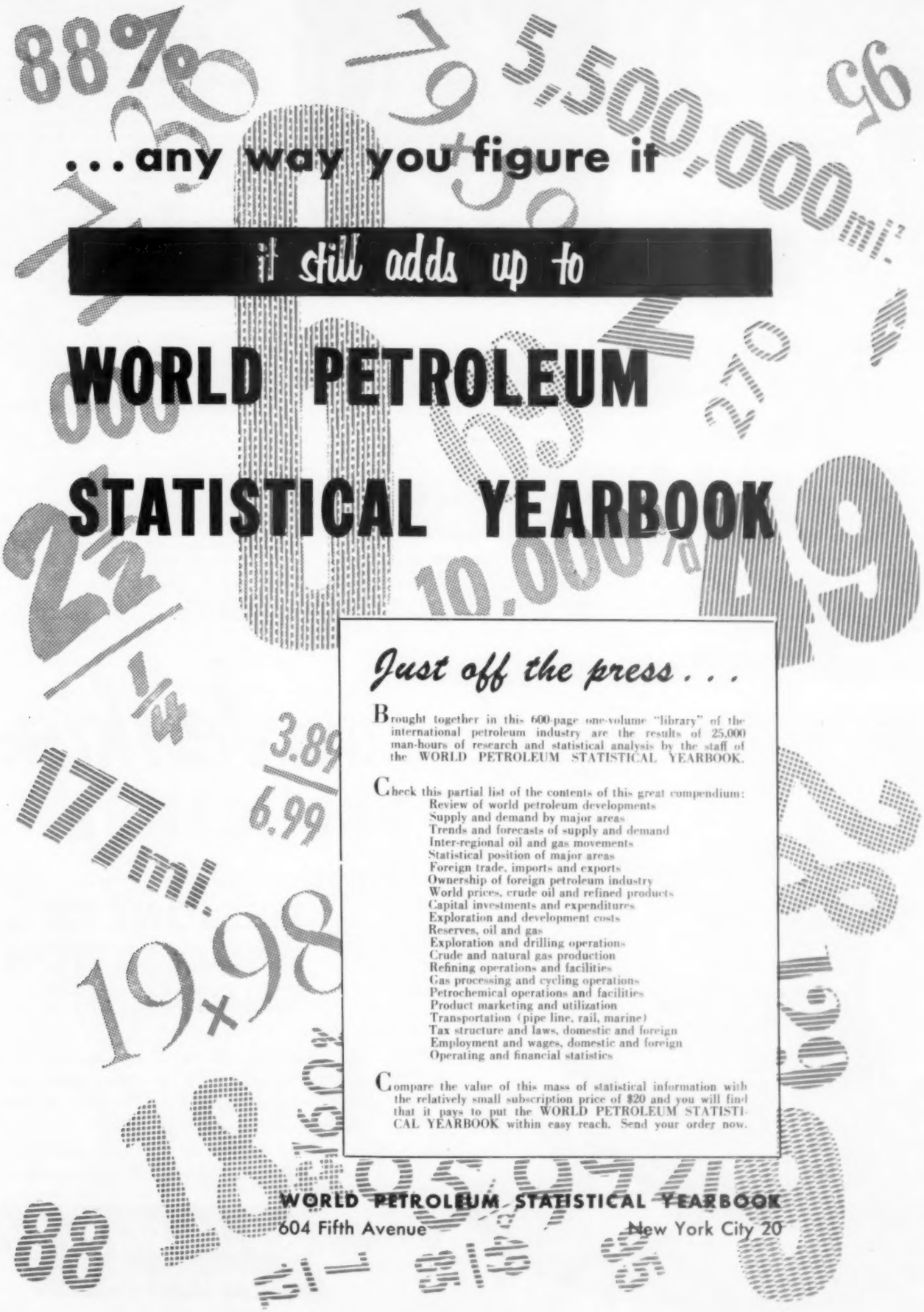

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Plans Products Line

Texas Eastern Transmission Corp. has planned to reconvert to petroleum products transportation the 1,168-mile "Little Inch" gas pipe line from Baytown, Texas to Moundsville, W. Va. The 20-inch diameter line now transports about 200 million cubic feet of natural gas per day. After conversion it would be capable of transporting a maximum of 235,000 barrels of petroleum products per day.

In an application to the Federal Power Commission seeking permission to remove this portion of the Little Inch from gas service, Texas Eastern seeks authorization to construct substitute natural gas facilities estimated to cost $71 million in order to maintain the natural gas system's present delivery capacity of more than 1.2 billion cubic feet per day. These substitute facilities would include approximately 382 miles of new 24-inch pipe line extending from Beaumont, Texas, through the prolific natural gas producing area of southern Louisiana to connect with the company's 30-inch pipe line to Kosciusko, Mississippi.

Noble A. Endicott

Noble A. Endicott, a vice president of The Continental Supply Company in charge of Gulf Coast operations, died at his home in Houston on September 4.

He has been with Continental for the past 38 years. He had moved to Houston from Dallas in 1948, having served as general manager of sales at the company's headquarters from 1940. His most recent previous position was as manager of Continental's Canadian operations.

Heads Oil Sales

Charles W. Haines has been named manager of petroleum industry sales development by Hewitt-Robins, Inc., Stamford, Conn. He has been with Hewitt-Robins for three years. Before that he was with the Shell Oil Co.

G. H. Daft

Daft Elected Houdry Vice President

George H. Daft, treasurer, comptroller, and a director of Houdry Process Corp., has been elected vice president in charge of finance and accounting.

A graduate of Drexel Institute of Technology, Mr. Daft served on the accounting staff of Sun Oil Co. for a number of years. In 1940 he transferred to Houdry, assuming the position of office manager and chief accountant. In 1944 Mr. Daft became comptroller, and in 1948 he was elected treasurer and a director.

To Manufacture Dry Ice

Lion Oil Co. has begun the production of dry ice and liquid carbon dioxide as a by-product of its ammonia plant in St. Charles Parish La. The CO_2 is recovered by purifying raw ammonia synthesis gas in a Girbotol unit.

Mandan Refinery Opening

(Continued from page 72)

New pumping stations also were added at Fergus Falls and Sauk Centre, Minn., on the line from Moorhead to the Twin Cities to handle the increased products load.

The Mandan-Moorhead line is slated to be the first of Standard's lines to use the new microwave communication system.

All of North Dakota's marketable production of crude is presently being bought by Standard Oil Purchasing Company, a wholly owned Standard subsidiary.

Originally it was planned to design the Mandan refinery for an initial capacity of 15,000 barrels a day with provision for later expansion to 30,000 barrels a day. Efficiency of operation and an expanding source of crude dictated a revision even before the designs were drawn and Mandan was set up for an initial capacity of 30,000 barrels a day.

Since the refinery now occupies only the southern half of the 900-acre tract bought by Standard, there is ample room for future expansion. All existing facilities were designed with an eye for possible capacity increase.

Resigns From Drilling & Exploration

John H. Lewis has resigned as vice president in charge of the foreign department of Drilling and Exploration Co. Mr. Lewis, an authority on foreign operations, has been with the company about 12 years, during which it has operated in most of the countries of the world.

The company's foreign department and its domestic contract drilling department are being consolidated and will be operated by Robert L. Rose who has been named president of the drilling subsidiary.

Wallace W. March is moving from Houston to Los Angeles where he becomes vice president, secretary and treasurer of the subsidiary.

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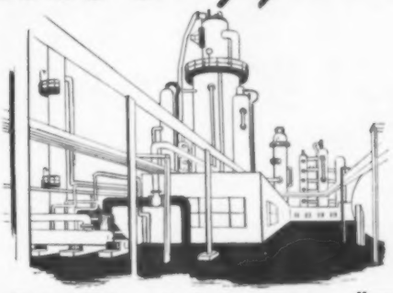

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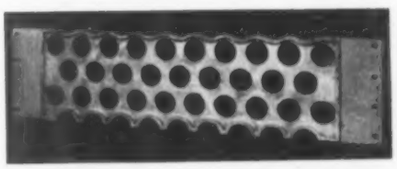

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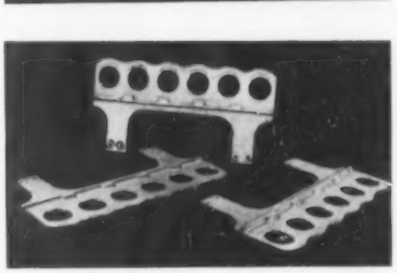

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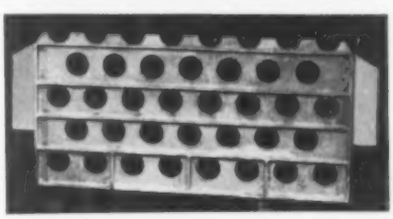

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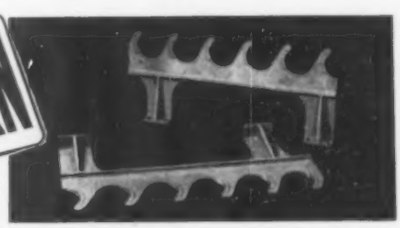

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Oil Education

A model oil refinery kit, ready for classroom assembly and study, has been made available to educators in the seven western states, Hawaii and Alaska by Standard Oil Co. of California. The new teaching device is a scale replica of a modern refinery with a typical complement of distillation towers, tanks, railroad tank cars and other equipment. It is a companion to the model oil field kit which Standard developed for schools three years ago.

New LimiTorque Catalog

Philadelphia Gear Works, Erie Ave. & G Street, Philadelphia, Pa., has published a complete new 21-page "LimiTorque" valve operations catalog, L-54. This catalog shows operational details of the latest LimiTorque SMA valve control for large or small valves.

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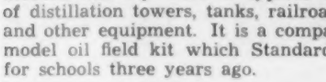

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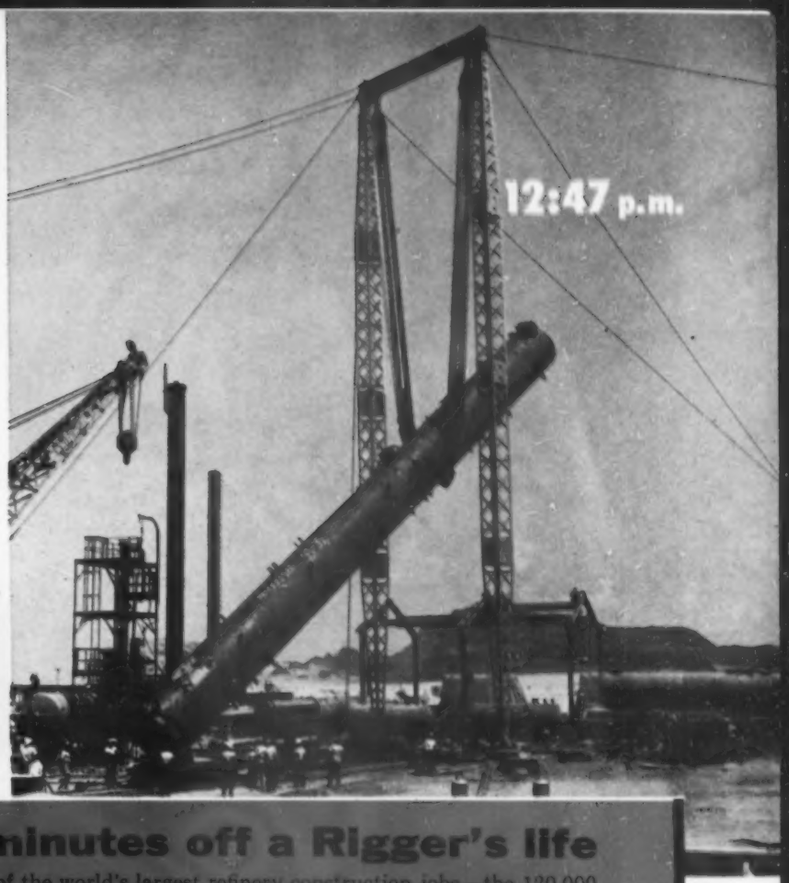

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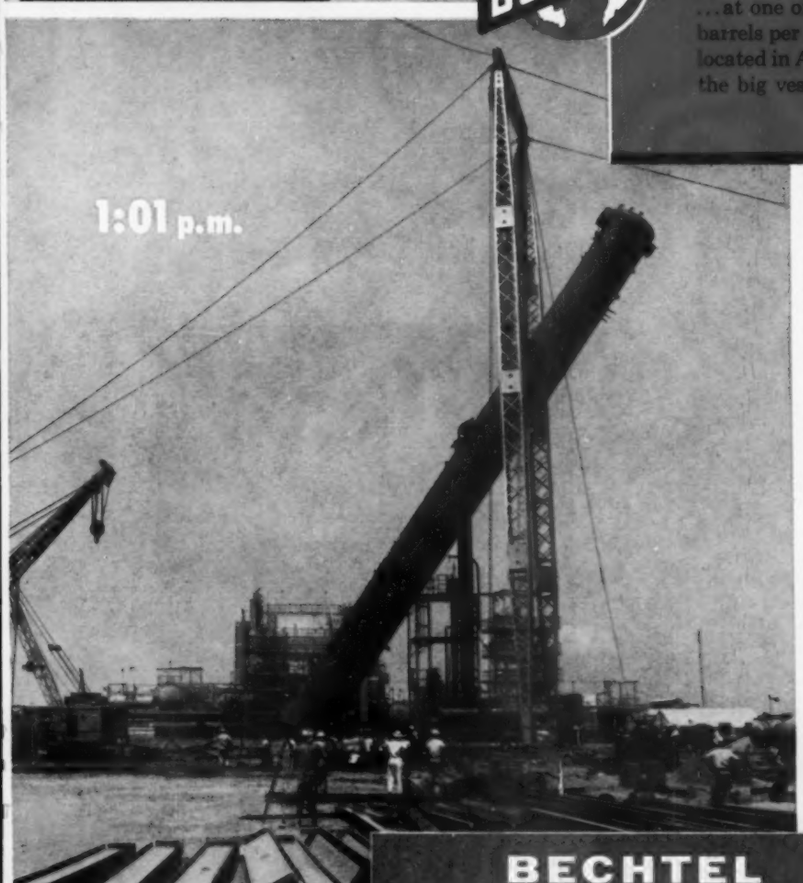

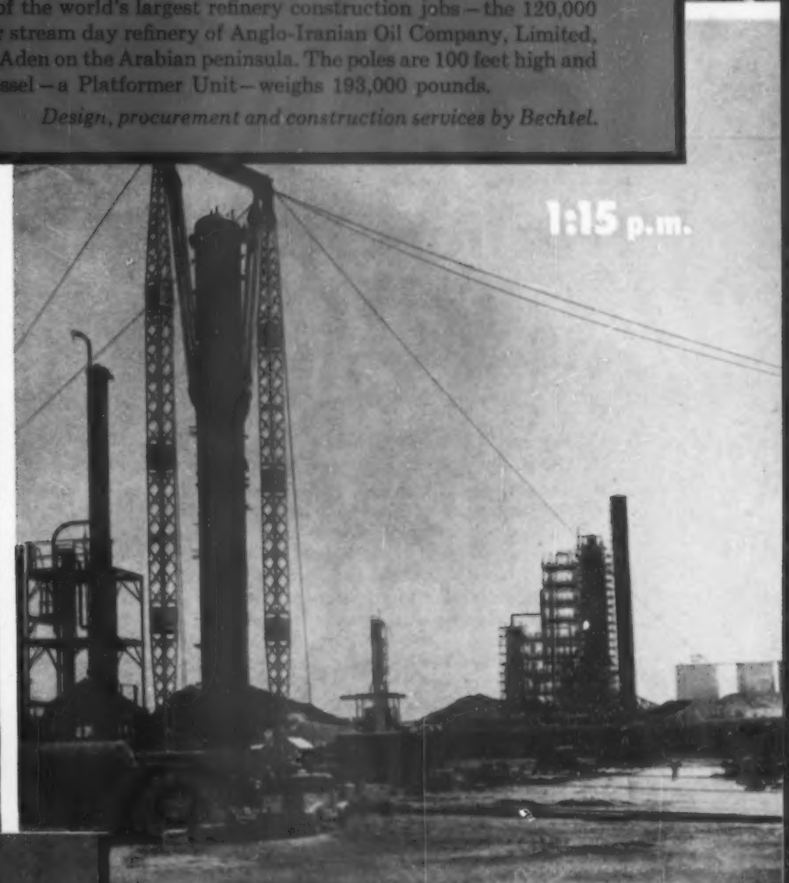

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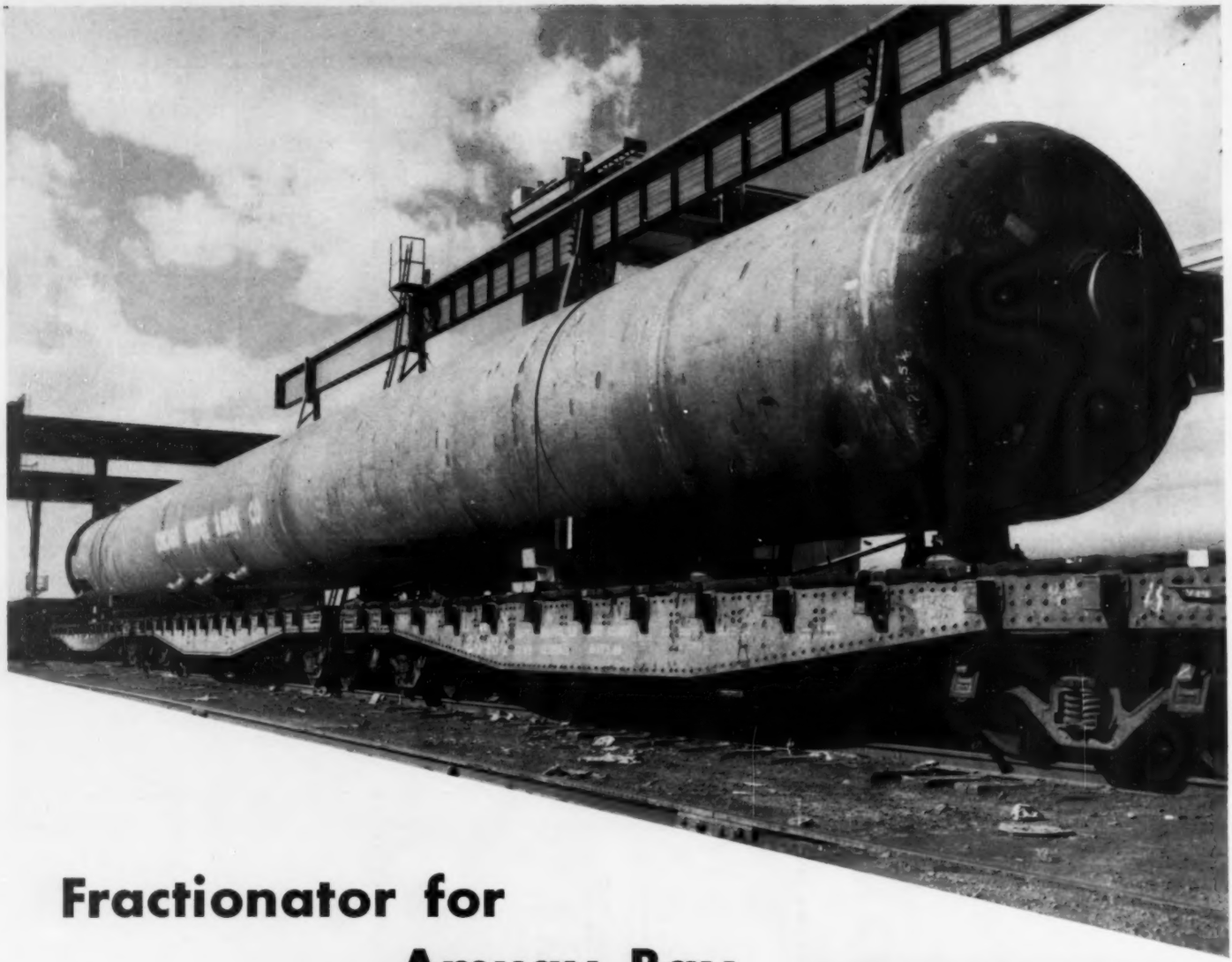

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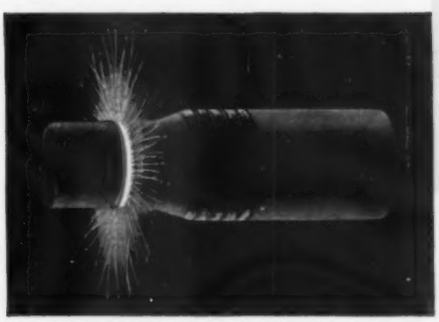

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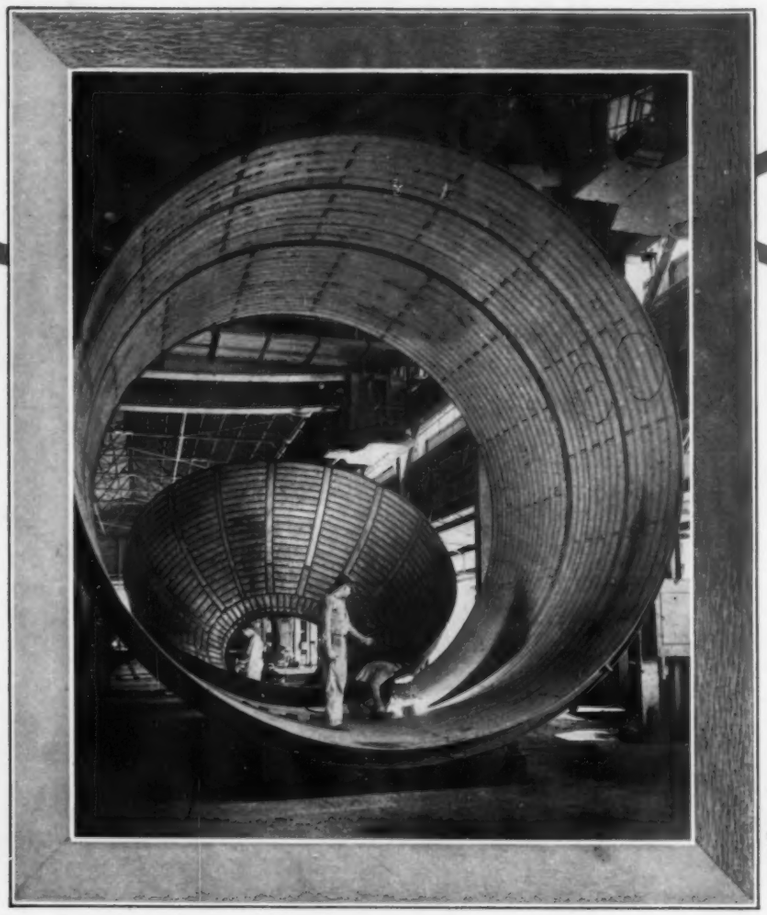

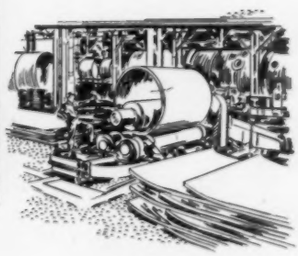

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